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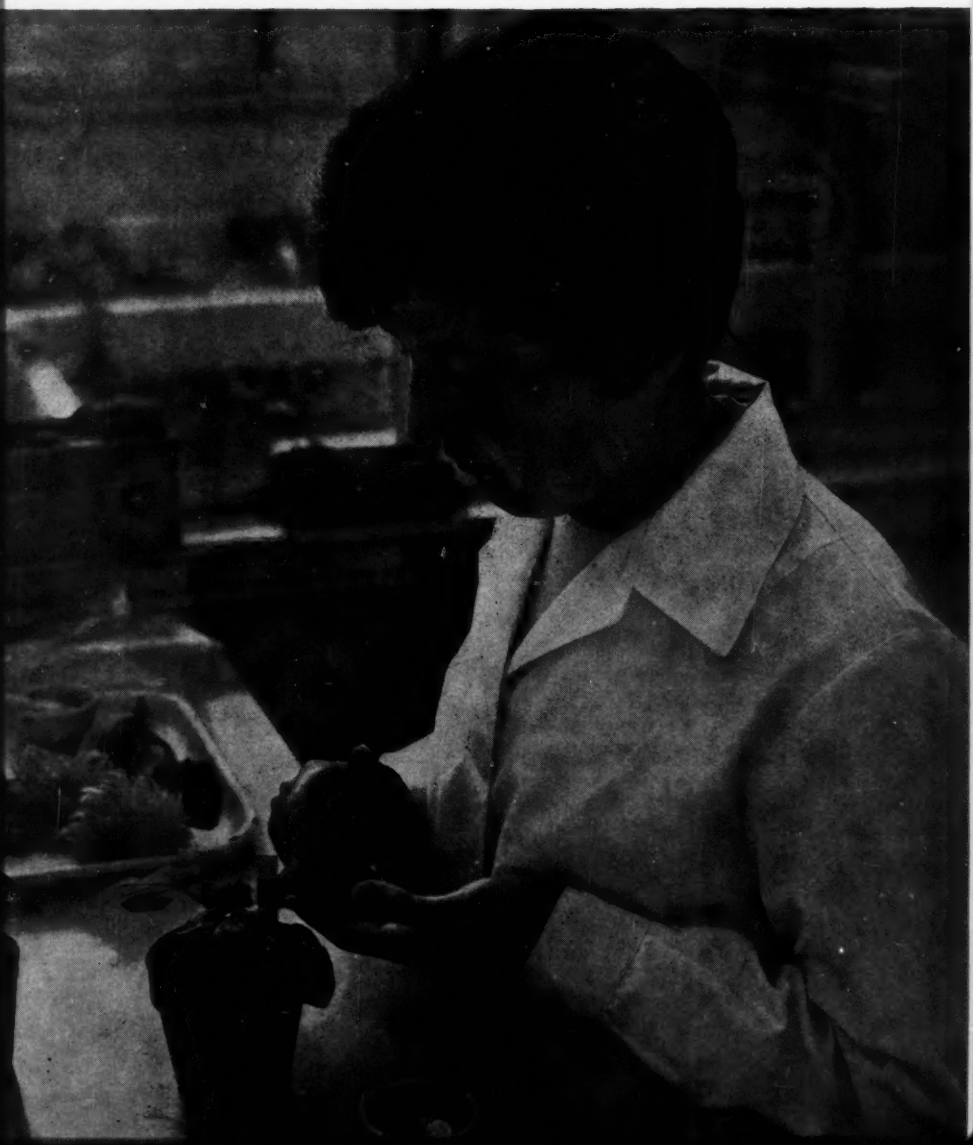

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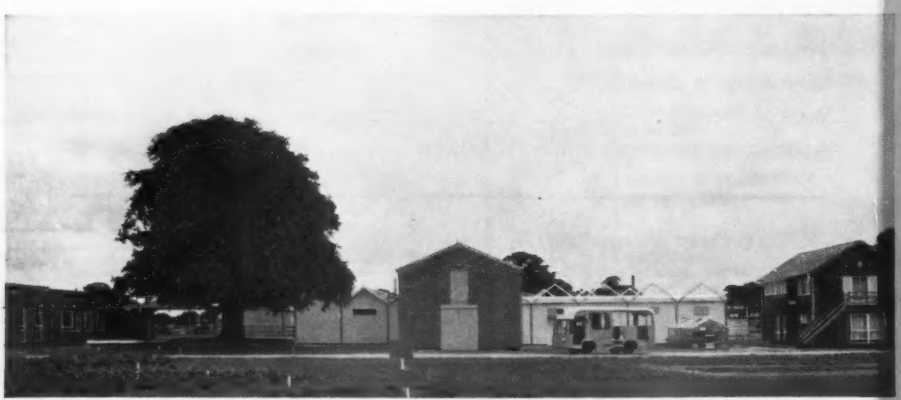

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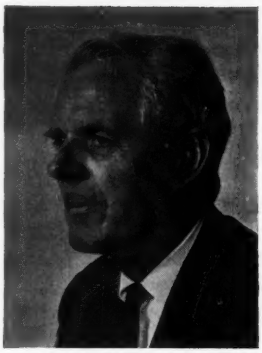


The Work of a Plant Pathologist

I. W. Prentice

PLANT pathology is one of the lesser 'ologies' and its practitioners are as a rule unknown to the man in the street. To a farmer, a plant pathologist is an adviser who deals with disease questions; to some people he suggests a white-coated inhabitant of an ivory tower; but for most he is non-existent.

The pathologists that I am writing about certainly exist, and even flourish. They are not in the N.A.A.S. although they are employed by the Ministry of Agriculture, Fisheries and Food, and they work, not in ivory towers but in the Plant Pathology Laboratory at Harpenden. Their work is varied; and as variety is the spice of life, the Laboratory might be likened rather to a spice island were it not for the spice island's unfortunate association with langour and long dreamy days! There is room here for only a broad outline of the work they do.

There are about a hundred people in all at the Laboratory, but the plant pathology department is the smallest of three and the staff includes typists and assistants who need not concern us now. So my pathologist belongs to a rare breed whose numbers scarcely reach double figures.

His first duty is to find ways of hindering new plant diseases from entering the country from abroad, and this is not as easy as it sounds. Plant diseases are known in other countries which could cause expensive crop losses if they became established here. But if plants are prohibited so as to keep out their diseases, food supplies may be interfered with, sources of improved varieties of plants cut off and a two-way trade in horticultural plants dislocated. The risk of accidental or illegal importation of diseased material would still remain, and so would the danger from disease agents that fly through the air with the greatest of ease (like a daring young man of an earlier generation) and pay no attention to official regulations. The plant pathologist must, therefore, learn all he can about a foreign disease before he can decide whether there is a sound technical case for prohibition or some other form of safeguard.

It is the administrator's responsibility to take all the relevant factors into account and to decide what import regulations are needed; and it is the plant health inspector's to see that these are complied with. But the pathologist continues to give help in recognizing and identifying the disease, and advises when the normal rule can be modified to permit imports for research or other special purposes.

It is difficult to put a value on such work in monetary terms but a recent occurrence may serve as a pointer. The plant health regulations controlling the importation of potatoes are designed, among other things, to minimize the risk of introducing a bacterial disease—potato ring rot—which occurs in several countries but not in Britain. If it became widespread it would probably cause an annual reduction of at least 10 per cent in Britain's saleable potato crop. Even if special steps were taken to produce uninfected seed and to sterilize farm machinery and stores so that a reasonably healthy crop could still be produced, this would, at a conservative estimate, add at least one per cent to the present costs of production. It follows that for each year by which the establishment of the disease is postponed there is a saving of £1 million.

In the spring of 1968 when maincrop ware potatoes were being imported from Europe, a plant health inspector when carrying out routine inspections found a few suspicious tubers. These were sent to Harpenden where ring rot was confirmed by bacteriological tests. This consignment and other similar ones where infection was found, were refused entry into England and the import regulations have since been amended to close the loophole that had been revealed. In such a situation it is, of course, not solely the plant pathologist who is involved, and the five-day week or 8.30 to 5.30 day matters little at such a time!

The small team of pathologists at Harpenden includes specialists in different subjects. In the case I have just mentioned the work fell on the bacteriologist, but when spindle tuber was suspected in potato crops a few years ago, the investigation was done by the virus specialist and our fears on that occasion proved unfounded. When white rust was first found on chrysanthemum in England it was identified by our mycologists. So specialization, even in such a small group, is essential to cope efficiently with each problem.

Regulations provide no guarantee that foreign diseases can be kept out of the country indefinitely, and our pathologist's second job is to deal with the invader when it comes. In this he has the co-operation of the N.A.A.S. as well as the help of the inspectorate and the support of the Ministry's administrative machine. But it is his job to decide what scientific and technical steps are needed, and to instruct the inspectors so that these can be carried out effectively. The action taken against fire blight (a bacterial disease of apple and pear which was first found in England ten years ago) has not prevented it spreading but has probably reduced the rate of spread considerably. There are grounds, however, for hoping that white rust of chrysanthemum, which also reached England about ten years ago, may have been eradicated as no new cases have been seen now for more than a year.

An attempt to eradicate a disease may cause hardship to individuals, but the loss to them is small in comparison with the overall gain from eradicating or even slowing the advance of the disease.

No man, it has been said, is an island, and what is true of men is true of laboratories. The disease situation on the Continent influences the situation

in Britain, and conversely. So our pathologist must, for example, visit Holland to discuss what research is needed on white rust and he must, in his turn, act as host to pathologists from a dozen countries when they visit Kent to see fire blight for themselves and to learn from our experience.

The pathologist's third job is to ensure that the Ministry's certification schemes for seed potatoes and other crops are soundly based, and are altered when new discoveries make this necessary. New schemes for black currants and fruit trees have recently been announced, and one for carnations is being studied. The preparatory work for these schemes is done at the Laboratory.

Our pathologist's fourth job is to find ways of measuring the damage that different diseases cause, for it is not always the most conspicuous disease that produces the greatest reduction in yield. In this, as in so many other fields, he has the co-operation of his colleagues in the N.A.A.S., and when a method has been perfected, he organizes co-operative sample surveys throughout the country to estimate, for example, the total loss caused by barley mildew.

This does not complete the catalogue. He conducts research on various subjects—potato wart disease, fire blight, white rust and so on. He examines seeds that require a health certificate before they can be exported; tests each new variety of potato for its reaction to wart disease; produces advisory leaflets on plant diseases; edits a quarterly journal; produces a monthly summary of the disease situation in England and Wales; issues warnings when conditions are favourable for the rapid spread of potato blight; maintains the national collection of plant bacteria; produces virus antisera; and attends many committees. But perhaps I have already said enough to justify my reference to the varied and strenuous life of Spice Island!

This then is the work of our composite pathologist (who is in fact ten people) dealing with a routine flow of material for examination—peas for New Zealand, mustard seed for Japan, specimens from the plant health inspectors, potatoes for wart disease test and diseased plants from someone's back garden. He has questions to answer and decisions to make—should the quarantine precautions against sharka disease be strengthened, or those against little cherry be relaxed? Should the boundaries of the area in Germany

Disease assessment; 'Harvest time'

from which we accept ware potatoes be changed? Are the restrictions on pea seed justified? He maintains contacts with international organizations and foreign workers as well as with colleagues, research workers and growers' associations at home. He collects information from many sources and copes with the organizational and managerial problems that arise in any small unit.

On a more personal note one may sometimes think that too few are attempting too much. Occasionally, all problems are insoluble, interruptions and irrelevancies are unending, frustration is widespread and the world seems to be populated with obstructionists! But more often the sun shines, the work is challenging without being oppressive, the machine works as one always hopes it will and the job seems well worth doing. Minor happenings bring their own satisfaction. A motor cyclist with urgent papers from Whitehall breaks the routine. Perhaps this sounds extravagant but one might have had an important comment to make, and here is evidence that when speedy action is needed, steps are taken to ensure that such information as is available is assembled. Or the Duty Room rings on Saturday morning in an attempt to clear a parcel of plants held by Customs at Heathrow because it has no health certificate. The caller has been unable to contact anyone from Plant Health Branch; and his relief at finding someone who knows that the addressee has had a special licence—which he has omitted to produce—is so plain as to be almost visible. Efficiency by customs and the duty officer—plus a bit of luck—have at the same time avoided a potential risk and delay to an express package of research material.

There is occasional light relief; the man who inquires whether the hole in his tennis shorts has been caused by a fungicide, the one who sends a random collection of plants with minor diseases and suggests that these result from a recent fall of Sahara dust, the inquirers who assume that a *plant* laboratory must be concerned with machinery.

And there is always the unexpected—invariably at a week-end and usually on a Bank Holiday, or that is how it seems. (Perhaps it is merely that during the week we *expect* the unexpected!) A box of Colorado beetles is put through a distant letter box when none of the Laboratory's small group of senior entomologists is accessible and when everyone in the Ministry with responsibilities at such a time is looking forward to a long week-end. So a plant pathologist 'stands in' with the others in case the incident should prove to be evidence of a serious situation. (On that occasion there was no response to the publicity on radio and television and in the press, and we concluded that someone with a warped sense of humour had been at work.)

To the plant pathologist his own work seems satisfying, important and useful, and, even if our efforts usually pass unnoticed by others, we can perhaps share with the king in *The Gondoliers* 'the gratifying feeling that our duty has been done'!

This article has been contributed by **I. W. Prentice, M.Sc., Ph.D., F.I.Biol.**, who is Head of the Plant Pathology Department of the Ministry's laboratories at Harpenden, Herts.

Photograph on front cover shows Harpeden inoculating a test plant with a virus so as to identify the virus

Some Thoughts on Large Cow Units

Pat Jones *Director, Bridget's Experimental Husbandry Farm*

NEVER before has there been so much interest in dairy herd expansion as there is in this country today. Most farmers have added more cows to their existing herd so that the average herd size has increased over the last few years. This has been brought about by economic pressures. Labour costs have risen and will continue to rise as will all the other products needed to service a dairy herd. Feedingstuffs, too, have risen but here farmers have taken advantage of research and sound practice and kept costs down, and there is still an opportunity for many to make even further improvements, particularly with their grassland management.

Herds of 70–100 cows looked after by one man are now becoming quite common and many herds will remain about this size as expansion often means the employment of additional labour. But several 200–300 cow herds are now being managed successfully and even bigger herds are being established. Little experience is available of managing these larger herds and it was to help in this field that the Bridget's unit was established.

There has in recent years been a considerable interest in low-cost housing and many farmers are using this type of building to house their expanded herds. Cow kennels are now extremely popular and as a means of quick and cheap expansion are to be recommended. In many designs the original cow kennel has been modified and covered feed areas are often incorporated. By using timber for the main structure costs have been kept to a minimum and many cows are now successfully housed for as little as £30 a cow. Some prefer the umbrella type building in which cubicles are installed which does tend to increase the cost slightly, while the life of the building is prolonged. Whatever structure is preferred individual cow cubicles are very desirable. These need to be of the correct design otherwise cows are reluctant to use them. Perhaps equally important is the actual bed of the cubicle which should be flat, firm and dry and built to within an inch of the heel stone. Chopped straw or sawdust can be used as the actual bedding. Provided correct measurements are adopted cows very quickly appreciate the advantages of individual beds and come cleaner to the parlour at milking times. Sawdust is used at Bridget's and last winter 3 cwt per cow was required

Farm buildings, with silos in the background, at Bridget's E.H.F.

costing 15*s*. per cow. Rubber mats save the need for bedding but being non-absorbent they quickly become covered with a smear of slurry and the cows need more washing before they can be milked.

The ideal size of group for winter feeding appears to be about 60–70 cows so the design of the buildings should allow each group to be kept and handled separately. Thought must be given to the movement of cows otherwise considerable time is wasted. The best way of grouping the cows is according to calving date. The first 60 cows to calve each autumn would be housed as a group and remain in that group throughout the winter period. This has the advantage that the cows can be fed as a unit and it is easier to watch for bulling amongst one group of 60 cows than amongst the whole herd. The cows can also be taken to the parlour in their group, which prevents them standing about in the collecting yard for very long periods while the others are being milked and reduces the size of the collecting yard required. It should be possible for the cows to return direct to the cubicle area as they leave the parlour because observations show that the majority of cows, having just had concentrates in the parlour, prefer to rest in their cubicles for up to 1½ hours before starting to eat the roughage part of their ration.

Most collecting yards are separated from the parlour by a wall and access is gained by doors. This tends to interfere with cow movement and in the later designs the parlour and collecting yard are continuous, so that the cows are separated merely by gates controlled from the pit by the milkers. Gate design in and out of parlours is not good. They often interfere with cow movement and cannot easily be fastened. The N.I.R.D. guillotine type of gate certainly appears to be better and similar gates should be incorporated in all new designs.

For summer milking a simple fly deterrent can be arranged over the entrance to the collecting yard. This takes the form of a spray boom through which clean water flows. The cows will pass readily through the curtain of fine spray but the flies remain behind and rejoin the cows after milking.

Herring-bone parlours are most popular at the present time and provided an efficient milking routine is evolved, allow quick milking of the cows to take place. The usually accepted standard is ten cows per unit per hour so one man will milk 50–60 cows an hour depending on the number of units he has. Although six units per man are sometimes installed there is a risk of overmilking unless the operators are prepared to hang up the clusters for the lower yielding cows. Most men prefer to handle five units each and on balance this is perhaps the maximum number per man which should be put in. Whether the parlour should be worked by one or two men is very much a personal opinion. For one man to milk 250 cows calls for shift milking and some farmers are reluctant to consider this. The alternative is to double the size of the parlour so that two men can milk the cows in about $2\frac{1}{2}$ hours at each milking. Greater continuity is obtained by this method as one of the regular men is always on with the relief milker and communications are therefore much improved.

The more frequently milk yields are recorded the better their aid to management. Weekly recording may take up more time but certainly is of great help in spotting cows which require veterinary treatment and allows more accurate changes in rationing to be made. If weekly records seem unnecessary then perhaps fortnightly are only slightly less helpful, but monthly recording seems too widely spaced and tends to give misleading information.

Cow records are essential to good management in large herds, and some form of colour chart is a great help in this respect. It is used to indicate service date, date of pregnancy diagnosis, calving, etc., and helps in spotting trouble in the herd before it becomes serious. Individual cards for each cow are also useful because, in addition to information regarding production, a complete veterinary record can be kept.

The local vet must be made part of the team responsible for the health of the herd. Most practising vets are extremely helpful and very willing to co-operate in a scheme. A year's experience of running a large unit has shown the value of routine visits by the local vet. He can see at a glance from the coloured tabs whether a problem exists or not and can advise accordingly during his visits on routine work. All animals are examined after calving and are pregnancy diagnosed eight weeks after service. This is a great help in maintaining a satisfactory calving index because the greatest problem in a large herd is likely to be keeping a regular calving pattern. To enable the vet to carry out his work a handling race and crush is essential and a holding pen where some ten cows can be yoked is also of great assistance, particularly if A.I. is used in preference to natural service. Cows seen bulling can be held in the pen until the arrival of the inseminator.

When planning a unit thought has naturally to be given to feeding systems. The choice is wide with many permutations. Ease of feeding must be the first consideration and on most units the roughage fed is silage because it can more easily be mechanized than hay or straw feeding. Self-feeding is a possibility and although wasteful has the advantage that no specialized machinery is required. With four groups of cows, four feeding faces are required unless restricted feeding is practised and this calls for more room at the feeding face. On balance a better system is to move the silage from the clamp to a central feeding area. Although some form of tractor grab is required and, for preference, a self-unloading trailer, rationing can be

Cubicles complete with bedding

carried out more accurately and alternative foods more readily introduced. A complete mechanized system is perhaps the ideal method. The basis of this is silage stored in towers, automatically unloaded, weighed and delivered to the mangers. Capital costs of machinery are somewhat higher but storage in towers is the most efficient of all silage systems and saves considerably on labour during the winter. On arable farms towers for the storage of moist barley direct from the combines, besides being a cheap method of storage, helps the progress of harvest and after rolling the barley can be added to the silage and also conveyed to the mangers. The basis of feeding is, therefore, high-quality silage and moist barley which will provide sufficient for maintenance and four gallons of milk. Additional concentrates should be fed in the parlour.

Grazing is still the ideal way of feeding grass during the summer and with a well-planned layout a herd of 250 cows should not need to walk more than 500 yards to the more distant paddocks. Even with a badly-designed system cows can walk 800 yards without too much difficulty. The question of whether to split the herd into two equal groups is again something a farmer himself must decide but experience at Bridget's suggests that it is unnecessary provided the paddocks are about five acres in area, giving feed for 24 hours and then rested for two to three weeks. It is very desirable to have straw on offer to the cows at both the beginning and end of the grazing season. Although this calls for a little extra labour, by putting the racks adjacent to the parlour, preferably on the exit side, the cows can help themselves as they return to the grass.

One problem which must be solved before large numbers of cows are housed together is the disposal of the slurry they produce. Perhaps the easiest way is to scrape the slurry daily into a manure distributor and spread it directly on to the fields. But under wet conditions on heavy land this is sometimes physically impossible and the slurry has to accumulate until weather conditions relent. Some form of storage is, therefore, desirable, either a midden or a slurry tank. The slurry tank has the advantage that it can be pumped out and moved by tanker or by organic irrigation direct on to the land. Runoff is often a problem so the slurry must be spread evenly and thinly to prevent this happening. At Bridget's, winter slurry has

a typical analysis of ·23 per cent N, ·10 per cent P and ·24 per cent K and judging by the crops which follow has a high manurial value.

Whether we approve or not large dairy units are here to stay and will slowly increase in number. Careful planning is necessary to avoid mistakes and the N.A.A.S. booklet *Some Aspects of Intensive Herd Management*, produced by the Dairy Husbandry Group, and which can be obtained free from any of the Ministry's Regional offices, is well worth detailed study before putting money into buildings.

Sugar Marketing in the Common Market

G. W. Ford

THE development of the common agricultural policy in the European Communities has been by stages: sugar has been one of the last of the major agricultural commodities produced in the Common Market to be provided with a comprehensively managed marketing scheme.

It is usual to think of the European Communities as the countries represented by the map above. However, when one considers the sugar policy of the Community one is forcibly reminded that the three French islands of Réunion, Martinique and Guadaloupe* are as much part of France in legal terms as Jersey and Guernsey are part of the British Isles. This also means that the managed marketing system has to extend to the cane sugar production of these islands as well as to the beet production in Europe.

Sugar beet is produced in all six member countries except Luxembourg: a little over two-and-a-half million acres are devoted to sugar beet compared with over 50 million acres devoted to cereals. As in Britain, sugar beet in the Community has an important place in the rotational crop system. Of the six million farmers in the Community 540,000 grow sugar beet.

*Réunion is an island lying in a south-westerly direction near Mauritius in the Indian Ocean and is about the size of Dorset. Guadaloupe and Martinique are a small group of islands in the West Indies, occupying between them about 1,000 square miles.

Because of the significant effects of weather on yields, the degree of self-sufficiency in the Community varies from year to year but recently the Community has always been self-sufficient in sugar production. As considerable changes in both production and consumption have been taking place in individual member states over the last few years, it is too soon to assess the impact of the new common policy in regard to sugar. Some time will need to elapse before a settled situation emerges for sugar in the Community, although production is almost certain to increase. In the past, France and Belgium have been traditional exporters of sugar. Italy has imported considerable quantities, but France in 1966–67 had a small deficit which enabled her to reduce her heavy stockholding. Another factor to take into account is that sugar is an important agricultural commodity in international trade and all member states are members of the International Sugar Council. It is conceivable that international agreements* may have long-term repercussions on the domestic sugar policy of the Community. The Community has also important trading connections with Africa, especially with the former French colonial territories including Madagascar.

Marketing policy

Although there is some refining of cane raws in the Community, most E.E.C. sugar is processed from beet into white sugar. Accordingly, the European Commission in its marketing arrangements bases its prime calculations on white sugar, and it relates these calculations backwards to determine the price of beet to the farmer or forward in regard to the important by-products, e.g., molasses, arising out of the refining process.

As with other major agricultural commodities produced in the Community, the twin parts to the management system are common marketing and common prices. The first stage of common marketing started on 1st July 1967, and common prices started from 1st July 1968, together with comprehensive marketing but certain transitional provisions will continue until 1975.

The form of the marketing system for sugar is basically similar to the pattern of domestic and frontier (and port) controls operated for the other major agricultural commodities in the Common Market, with one important exception. In all arrangements made for other commodities up to now, farmers have been free to produce as much of the produce concerned as they liked and whatever quantity they marketed they were assured of at least the official intervention price for all their produce; they also knew that the Commission in Brussels and the administration in the member states would act with their best endeavours by domestic and frontier management of the market to ensure that the target price for the produce was attained in the representative markets. This target price is the price which is considered to give the farmer a fair and reasonable return for his efforts and financial outlay.

However, in the case of sugar, there have been understandable fears that such open-ended arrangements might produce unmanageable surpluses with consequential heavy costs on the Community's Agricultural Fund. Accordingly, superimposed on the standard marketing system are quota

*At the time of writing this article a United Nations Sugar Conference had just been held in Geneva.

arrangements. If these quotas are exceeded, then according to the amount of the excess, the support from Community Funds is either reduced or eliminated. In the latter case, the price that the beet grower would obtain for his excess production, would be related to the free world market price for white sugar which currently would give a return to the producer that would be well below the European grower's costs of beet production.

Marketing and price arrangements for 1967–68

For the transitional year 1967–68, member states continued to fix their own sugar prices, except that they were not allowed to enlarge the gap which existed between their 1966–67 prices paid to farmers for sugar beet and the intervention price operative for 1st July 1967, namely, 212.30 units of account (equivalent to U.S. dollars) per metric ton. Sugar import duties were replaced by variable import levies. These levies represented the difference between the offer price of sugar imports and the threshold price, which is the port or frontier price determined at such a level that when the imported sugar reaches the domestic market of the Community, the price of sugar will not be less than the target price. The import of sugar was not liberalized until 1st July 1968. Imports into a member state in 1967–8 were made on the basis of public tenders devised so as to give a first preference to exports from other member states. Provision was also made for the payment of export subsidies in respect of exports from member states, the details of which differed according to whether the exports were to other member states or to countries outside the Community. The arrangements for export subsidies operated only up to a maximum production in the Community of 6,335,000 metric tons of white sugar. This was divided among the member states as follows:

	metric tons
France (including the above-mentioned overseas departments)	2,300,000
Germany	1,700,000
Italy	1,230,000
Netherlands	575,000
Belgium/Luxembourg	530,000

Quantities produced in excess of these quotas could not be sold within the Community, and if stored and carried over into the 1968–69 season these excess amounts will be deducted from the 1968–69 quotas. Moreover, to prevent over-stocking in the Community, member states have not been allowed to accumulate stocks at the beginning of 1967–68 and 1968–69 years more than their requirements for the year plus 12½ per cent; any excess is deducted from the next year's quota.

Because it was expected that Community production would exceed consumption requirements by 400,000 metric tons or more, regulations were made to allow subsidies to be paid in respect of sugar denatured for inclusion in animal feedingstuffs or used in the chemical industry (e.g., for the making of such products as citric acid). Finally, any subsidies paid by member states in 1966–67 were allowed to continue in 1967–68 but the rates of these subsidies could not be greater than those in 1966–67.

Comprehensive marketing and pricing arrangments from 1st July, 1968

The marketing scheme extends to beet and cane sugar, sugar beet, molasses, syrups and synthetic honey. The area with the largest surplus of sugar in the Community (i.e., the three Departments in northern France) is the area used for determining the target price for white sugar (e.g., the same price will apply to the Benelux countries and Federal Germany). This price will be determined at the Annual Price Review* and the sugar prices will relate to the *following* year starting on 1st July. At the same Review will be fixed the intervention price for white sugar in the area with the largest surplus. This is a fall-back or guaranteed price and comes automatically into operation when the market is depressed. Appropriate intervention prices will be fixed for other regions in the Community, on the basis of normal harvest conditions and the market price obtainable from the free movement of sugar in the Community. To protect sugar beet growers, the sugar factories are obliged to pay not less than a guaranteed minimum price for sugar beet, which is derived from the intervention price for white sugar for the area concerned. The costs of the storage of white sugar in the Community, made from Community-produced beet or cane will be borne by member states which will finance these costs by a standard charge on all sugar manufacturers in the Community. If sugar is denatured for animal feedingstuffs or is used by the chemical industry, appropriate subsidies will be paid.

Threshold prices for white sugar, raw sugar and molasses will be fixed annually, on the basis of which will be calculated the variable import levies for imports of these products. This is on the assumption that the c.i.f. price to a Community port is lower than the theshold price. If the reverse position is true (and this could have been the position a few years ago), a subsidy may be paid in respect of imports and a levy applied on exports from the Community. If the c.i.f. price is lower than the threshold price, a subsidy is payable on exports. All imports and exports require a licence. There are no import quotas or other restrictions or import duties other than the above-mentioned variable import levy.

Finally, in common with the schemes for other commodities, powers are taken to enable special measures concerning trade with countries outside the Community if the domestic market situation is seriously disturbed.

Between 1968–69 and 1975, the Community quota for white sugar is 6,480,000 metric tons. This figure is some 13 per cent higher than the average for the production of recent years but is held to be in line with production expectations and consumption trends. This quota is divided among member states as follows:

	Metric tons
France (including the overseas departments)	2,400,000
Germany	1,750,000
Italy	1,230,000
Netherlands	550,000
Belgium/Luxembourg	550,000

Within the above quotas, each member state fixes a basic quota for each sugar factory or group of factories where they are being operated by a single

*The Price Review arrangements and procedures are not the same as those for the United Kingdom. The Price Reviews are due to take place in the late summer of each year.

company or single co-operative: there is also a maximum quota for each factory equal to 135 per cent of the basic quota. In turn, each sugar factory, in consultation with the representatives of the growers concerned, fixes the appropriate quotas for individual growers. Quantities of sugar manufactured in excess of the maximum quota must be sold outside the Community without any export subsidy (i.e., in current circumstances at a penal price and factories will charge the growers accordingly since the minimum price for beet does not apply to such sales). The arrangements are slightly more flexible and more complicated than the description above: for example, it is possible to carry over limited quantities to the following year.

As regards sugar marketed in excess of the basic quota but within 135 per cent of this quota, the minimum beet price guaranteed to the grower will be only 10 units of account (instead of 17 units of account) per metric ton and the member state will impose a corresponding charge on this sugar sold by the factory.

A regulation governs the arrangements and conditions in contracts between factories and growers. It is intended to abolish national quotas from the season 1975–76 onwards. Thereafter there will be no discrimination among Community growers.

Because of structural conditions in the industry in Italy and of difficult natural conditions where sugar is produced, the Italian Government has been allowed to give Italian growers a subsidy which may not exceed 1.10 units of account per metric ton of sugar beet during the transitional period 1974/5. In the same period, the Italian sugar factories may receive a subsidy not exceeding 1.46 units of account per 100 kilograms of white sugar sold.

In order to give the sugar market general protection, products containing added sugar including, for example, the *added* sugar in canned fruit, pay a variable import levy in respect of the added sugar. Similar Community exports of such products can receive an export subsidy in respect of the added sugar content.

The Commission has in preparation legislation which will regulate or prevent, as the case may be, the use of synthetic sugar substitutes including cyclamates. This legislation, although designed primarily in the interest of protecting public health, is likely to have repercussions for the sugar industry and the sugar-using industries including the soft drinks and ice cream industries.

Prices for the year 1968–69

	units of account per metric ton
Target price for white sugar	223.50
Intervention price for white sugar	212.30
Minimum price for beet (within the quota) with 16% sugar content (e.g., the wet pulp remains the property of the grower)	17.00
Price for beet above the quota but not exceeding 135% of the quota	10.00

The marketing arrangements are bound to affect not only the production of beet but in the longer term the number and the siting of sugar factories. Many are out of date by modern standards or otherwise unsuited to present and future needs. This process of change is being assisted in the pattern of control of both private and co-operatively-run sugar factories. In the private sector, a number of company amalgamations have taken place.

As regards co-operatives, the position varies from state to state: there are no beet growers' co-operatives in Belgium and Luxembourg, but in Holland six sugar co-operatives process about two-thirds of the country's production. In France there are thirty-nine co-operative societies which between them operate twenty-two distilleries, thirteen sugar factories and four refineries. There are some growers' co-operatives in Germany and, in recent times, co-operatives have been starting in Italy.

Sugar statistics

	Area under beet cultivation ('000s hectares)	
	1961–62	1967–68
France	359	315
Germany	260	294
Italy	227	332
Netherlands	85	100
Belgium/Luxembourg	62	78
Community	993	1,119

White sugar production in the EEC
(*metric tons*)

	1961–62	1967–68
France*	2,070,000	2,030,000
Germany	1,329,000	1,895,000
Italy	897,000	1,506,000
Netherlands	540,000	695,000
Belgium/Luxembourg	409,000	520,000
Community	5,245,000	6,646,000

*Including Réunion, Martinique and Guadeloupe.

Minimum prices for sugar beet units of account per metric ton
(16% *sugar content*)

	1961–62	1967–68
France	12.53	13.79
Germany	16.88	18.13
Italy	14.76	19.68
Netherlands	12.87	16.26
Belgium/Luxembourg	11.84	16.86

Cane sugar production in the French Overseas Departments
('000s metric tons refined sugar equivalent)

	Réunion	*Guadeloupe*	*Martinique*	*Total*
1955–56	169	124	82	375
1960–61	209	161	86	456
1963–64	215	161	59	435
1964–65	192	177	67	436
1965–66	246	162	51	459
1966–67	220	147	54	421

Bail milking in the Somerset lowlands

Farm Structure on the Somerset Lowlands

W. Johnson

OF the county's 860,000 acres some 150,000 acres form the Somerset Lowlands. Much of this is below the 25 ft contour and consequently below the level of the high tides of the Bristol Channel. For many centuries it was land of shallow marsh where all but the driest areas were subject to flooding.

The soils are alluvially derived mainly under estuarine conditions, being deep clays and fine silts deposited by rivers or from the sea. Throughout its history the area has been subject to flooding, so that where hollows have retained moisture, fen peat has resulted, and thus the soil profile may consist of silt, clay or peat or, as is often the case, a mixture of these.

Inherently the area has tremendous agricultural potential. It has, however, one basic problem, a surfeit of water; it is surrounded by high land, including the Mendips, which provide a considerable catchment area to add to the already overloaded drainage channels of the low land. There is evidence that a considerable area was once covered with water, and on what is now dry land the sites of lake villages and the fishing areas of the monks of Glastonbury can be found.

The enclosures were implemented in this area in the late eighteenth and early nineteenth centuries and were accompanied by considerable drainage and reclamation. Fields were not bounded by hedges but by open ditches or 'rhynes' which served as drainage channels for the low land. The land was apportioned to those with common rights, as prior to enclosure the land left

by the receding flood water served as periodic grazing and was used as common land, with the dwellings on the higher ground. An attempt was made to share the indifferent land, because much of the area was only fit for hay and summer grazing. The result was not a holding within a ring fence but a fragmented one with buildings on the higher ground and a share of the lower moorland pastures in one, or several, parcels of land.

A recent survey by the National Agricultural Advisory Service to determine the typical farm for a part of this area has confirmed that fragmentation is still a considerable problem and is the rule rather than the exception.

The typical farm is one of sixty-five acres with the land lying in four blocks. Each block may comprise several adjacent fields or just one isolated field. Of the thirty-eight farms which were visited in the survey only three could be described as being within a ring fence. Nine farms had more than seven blocks and one farmer had seventeen, mainly in single, scattered fields.

The typical holding has a parcel of land around the house and buildings on higher ground, with the three other blocks out on the lower moor but within a radius of two miles. Rarely is a significant proportion of the land beyond this. More extreme cases of fragmentation were encountered, among them the case of a farmer with his land scattered up to six miles around his buildings and his house nine miles away. This farmer was a newcomer to the area and was experiencing some difficulty in finding sufficient land. Newcomers often go to considerable trouble to obtain enough land to start farming, with the result that further fragmentation occurs.

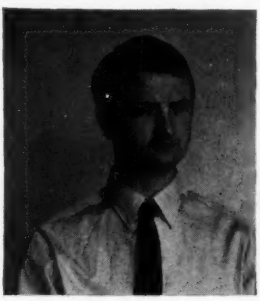
Fragmentation gives rise to many problems and limitations, not the least of which is the time and effort wasted in travelling, but there are also others which are peculiar to this area. Such a problem is the drainage dyke or 'rhyne' as it is known locally. Rhynes are open ditches which, as well as being drainage channels and field boundaries, serve as a source of drinking water to the stock; this, with fragmentation, would otherwise be difficult, if not impossible, to provide. If an individual wishes to lower the level of water in the rhynes to drain his land and improve its potential, his endeavours may be met with protests from his neighbours on higher ground who are left with insufficient water for their stock. The provision of sluice gates and pumping units to overcome this on each portion of land would involve considerable expense.

Access to off-lying land is also a difficulty because of fragmentation. It often means that a farmer has to rely on the goodwill of his neighbour to cross a field to get to his own field. The main problem of access is that an area of land may be farmed by several persons who rely on one access road only (known locally as a 'drove') so that there is no one person responsible for its upkeep. Droves can be several miles long and are particularly difficult and costly to maintain, especially where they cross peat land. The co-operation needed to keep them in good repair may not be freely forthcoming, and where it is, the contribution each should make in a joint venture towards improvement is often difficult to assess.

The typical farm has nineteen cows and the followers necessary to maintain this number. The cows calve in the spring and are milked in the field through a bail, which can be moved to the scattered fields in turn. The bail is typically a 4-stall, 4-unit type. Of the farms surveyed only seven did not milk through a bail, and of these, five milked by hand. None of the herds milked by hand exceeded twenty cows, and these were often milked by two or three

persons. It must be admitted that the farmers themselves enjoyed bail milking and felt that it is a perfectly satisfactory method. It does, however, tend to limit the herd size in that the collecting area can quickly become a quagmire. Concreting a large area in the number of places a bail may be required during the grazing season is costly, and it is not a practical proposition to take the cows back to the buildings from all the fragmented grazing land.

Farmers with scattered fields may have a number of landlords; up to eleven were encountered for one farm, and several had six. This means that many of the farms are ineligible for grant under the Farm Improvement Scheme. Buildings are certainly a limitation to increasing the stocking of the majority of the holdings. One farmer had no buildings at all and hand milked outside, even during the winter. Of those in the survey, thirty-three farmers housed and milked in a cowshed but only four of these were able to house the entire herd in one shed. By using a second shed seven more housed all their cows, but even then twenty-two farms did not have sufficient housing. In such cases the cows in milk would be housed and the dry cows left outside.



W. Johnson, B.Sc. (Hons.) (Leeds), was an Assistant District Agricultural Adviser for the N.A.A.S. in Somerset from September 1966, to June, 1968, and is now a District Agricultural Adviser for the N.A.A.S. in Flintshire.

It would be expected, therefore, that in the face of these difficulties the farmers would be making a considerable effort to consolidate their holdings, but this is not so. Only eight had achieved any consolidation during their farming lifetime, while fifteen had dismissed the situation as impossible, and ten were content. The difficulties of consolidation in this area are considerable and these would seem primarily to be that any attempt to exchange land is immediately regarded with suspicion and puts the instigator in a poor bargaining position. Landlords and tenants may also have conflicting views and ideas on the subject. A move in one direction may consolidate a landlord but create increased fragmentation for the tenant.

There is a general feeling in the area that farm size is flexible, to be added to as the monetary situation allows and the need arises. This is most easily done by obtaining the isolated parcels of land which become available, for it is generally recognized that the highest total price is obtained on disposing of a farm if land is sold in small lots, so that a consolidated holding may again be sub-divided at disposal. Such a sale would tempt many buyers; the demand for land is very high.

The people of the district accept fragmentation and even enjoy and encourage it, preferring 'to travel two miles by car than walk four fields to

fetch the cows in'. The typical farmer is also content or considers consolidation to be beyond his ability to attain.

In general, the farmers expressed themselves as being 'content with their lot', and the sons are very ready to take on the farm from their fathers. Income from the farm having nineteen cows is not high, but it is higher than that for a farm of similar herd size elsewhere in Somerset because costs are kept so low. The family provides the labour and usually buildings have been so long in existence and are so simple in their form that their annual cost is small. Machinery is confined to that required for haymaking and milking. The area does, however, suffer from the high water table, a general lack of facilities such as winter housing and, in particular, from fragmentation.

The Farm Manager of the North of Scotland College of Agriculture's farm at Craibstone, Aberdeen, describes the range of experimental and investigational activities which have been developed there in recent years

Craibstone, Aberdeen

—A North of Scotland College Farm

J. M. Maddox

The farms

The land farmed by The North of Scotland College of Agriculture at Craibstone, some five miles west of Aberdeen, consists of the original Craibstone Estate, purchased by the College in 1914, and the adjacent MacRobert Experimental Farm, purchased in 1965 by the MacRobert Trustees and made available to the College free of rent for the purpose of assisting the expansion of the College's investigational and experimental activities. The total acreage, excluding woodlands, amounts to 490 acres arable land, 90 acres permanent grass and 230 acres of hill and rough grazings. The arable land and permanent grass lies between 250 and 550 ft, while the hill rises to 850 ft above sea level. The soils, which vary greatly as regards character and depth within short distances on the farm, are derived from glacial drift overlying granite. Fertility is basically poor and the farm has a northerly aspect, mellowed, to some degree, by woodlands on the Estate.

Apart from the main steading there are six other steadings, each of which has been developed as the centre for one or more enterprises. At Craibstone itself are sited the dairy byre, beef rearing and fattening houses, grain drying and feed processing plant, stores, implement sheds and workshops. Other steadings house poultry and turkeys, pigs, and suckler cows.

A commercial feature of the stock buildings is their intensive use, empty stockyards being filled with either pigs or turkeys during the summer months.

The cropping policy is designed basically to provide animal feedingstuffs and the only cash crop is seed potatoes. Grassland features predominantly as a crop, the aim in management being the utilization of at least 200 units of N per acre.

Farm statistics

Crop acreages and livestock numbers at June, 1968, were as follows:

(*December 1967 figures in brackets*)

Crops	**Acres**	
Cereals	172	
Potatoes	27	
Swedes	31	
Rotation grass	260	
Permanent pasture	90	
Hill and rough grazing	230	
Cattle		
Dairy cows	86	(99)
Dairy followers	70	(45)
Bucket fed beef calves	45	(99)
Suckler beef cows	40	(40)
Grazing beef stores	209	(—)
Fattening beef cattle	35	(210)
Bulls	3	(3)

Poultry		
Laying hens	6,700	(7,000)
Rearing pullets	7,000	(7,000)
Turkeys	3,000	(2,000)
Sheep		
Ewes	176	(237)
Lambs	215	(21)
Rams	14	(6)
Pigs		
Sows	75	(71)
Gilts	5	(18)
Young pigs	229	(228)
Fattening pigs	400	(480)
Boars	7	(8)

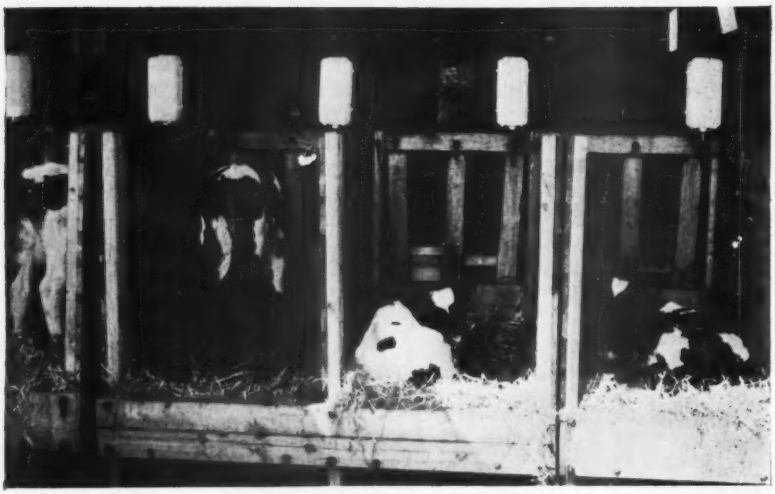
A major function of Craibstone farm, as of all farms operated by the College, is the conduct of husbandry investigations, instigated by the various specialist departments of the College. A brief description of the major areas of study and some of the work in progress follows.

Livestock

Investigational work related to animal production is carried out by various specialist departments of the College, individually and jointly. The Department of Animal Husbandry is involved in most of these investigations but other Departments such as Grassland Husbandry, Veterinary Hygiene and Chemistry are vitally concerned in several of the projects. A high proportion of investigations are concerned with problems of beef production, ranging from calf rearing to carcass assessment.

An investigation that has aroused much interest relates to the problem of the profitable production of suckler calves on lowground farms. A herd of 40 Hereford × Friesian cows is at present maintained and these are wintered on straw based diets using draff (distillers grains), or barley and urea, along with adequate minerals and vitamins, to supplement the straw.

Calf rearing studies have been concerned with feeding techniques such as *ad lib.* and once-a-day feeding, and housing in relation to health hazards.



Calves housed in Winconsin crates at Craibstone

With regard to fattening cattle the emphasis, apart from intensively fed animals, has been on the economic production of the 18-month old finished beast. The inter-relationship between breed or cross and type of diet has been investigated and a current study is concerned with patterns of feeding from the 3–4 month old stage.

In the majority of the investigations concerned with fattening cattle detailed carcass assessment is carried out.

The general objective of work on beef cattle is to devise viable systems of production, matching available feeds and animals to produce a satisfactory carcass; similar work is commencing in sheep production. Investigations concerned with pig production have for the past few years been mainly concerned with the nutrition of the pregnant and suckling sow. Currently, the partition of feed during pregnancy is being studied.

Poultry

In the area served by the College the majority of farms are small and a high proportion of the labour is family labour. Poultry play an important role in these circumstances. Investigations cover the economic, environmental and nutritional aspects of husbandry and a flock of 7,000 layers, mostly in cages, is available for experiments.

A particularly important line of investigation is the use of farm mixed rations, especially those produced from home-produced grain and protein foods, such as barley, meat and bone meal and fish meal. Currently an experiment is proceeding into the use of different sources of non-protein-nitrogen.

With regard to the environment, an interesting investigation in progress is a comparison of layers in a house kept at 75°F (23·9°C) with a control group maintained at more conventional temperatures. Results so far are encouraging, particularly in relation to food conversion efficiency.

No breeding work is in progress, but a small section of the flock is used for comparing the performance of different hybrids. There is a substantial turkey

enterprise on the unit and approximately 4,500 are fattened annually. The emphasis is on low cost, utilizing home-bred poults, farm mixed foods, and buildings empty during the grazing season.

Crop production

With the exception of seed potatoes, which are an important cash crop in the College area, arable cropping is complementary to stock farming.

In response to a reduced agricultural labour force, farmers are seeking simplified systems of cropping allied to economies of scale and these two aspects are providing much of the stimulus of present investigational work. This is carried out on the 69 acres of land at Sunnybrae and at Woodlands field.

Investigations with seed potatoes are continuing on sprouting control by storage environment regulation, using the varieties Majestic and Pentland Dell. Another study is concerned with the measurement of the net saleable product response to variations in NP and K using the same varieties.

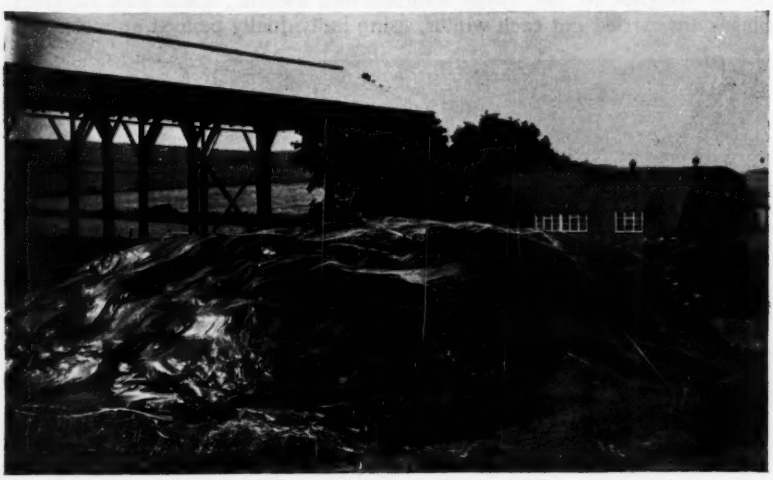
The major diseases of seed potatoes and, in particular, gangrene, blackleg and skinspot, have been subject to concentrated study by the mycology department. Several useful pointers to control have been established.

The cereal acreage in the North of Scotland, of which around 50 per cent is barley, is highly susceptible to climatic hazards. Harvesting may be very protracted over a period of 4–5 weeks from late August onwards and head losses due to high winds is a major cause of low yields.

Accordingly, variety testing has as a main objective the selection of barley varieties which have short, strong, wind resistant necks. Complementary investigations are concerned with the use of dessicants to aid earlier harvesting, and chemical growth regulators for controlling lodging. Grain storage techniques are examined and currently the possibilities of using propionic and other acids are being studied.

Weed control studies in relation to the flora encountered in the North East are of importance, particularly in the fodder roots and potato crops,

Experimental lots of silage in vacuum silage pits at MacRobert Experimental Farm



while cultivation studies range from the use of rotary ridgers to 'chemical ploughing'.

Because of the complementary nature of stock and crop farming, long periods of grain cropping are not very common in the North of Scotland and 2–4 years in grass provides an adequate break for most diseases and pests. The study of break crops at Craibstone has not therefore had a high priority.

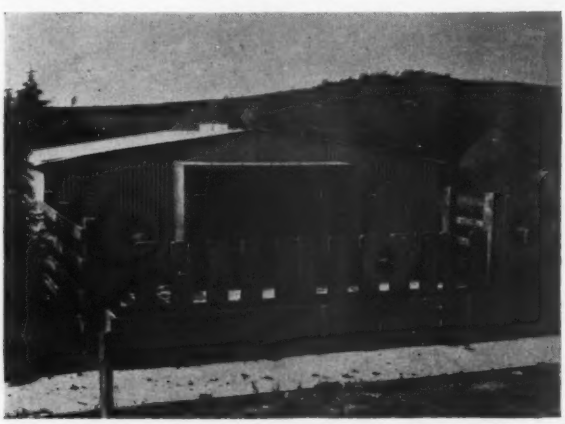
Grassland

As a crop, grass is of paramount importance in the College area and approximately 70 acres of land at the MacRobert Experimental Farm are devoted to grassland investigations. As the basis of production, new and existing varieties of grasses and clovers are constantly screened for agronomic differences, and *in-vitro* digestibility comparisons are made. Past investigations with regard to productivity have established for the area yield responses to fertilizer, particularly nitrogen, applications. This work continues but the emphasis in current investigations is on the utilization of grazed and conserved material. Two grazing investigations with beef cattle are in progress. One is a replicated trial comparing the output of beef from a paddock grazing system, manuring being at two levels of nitrogen application—150 and 300 units per acre, each level being stocked at three different rates—and the second relates to the problem of fattening cattle on grass fertilized at up to 500 units of nitrogen per acre.

Complementary to these grazing trials is an investigation on the long-term effects of the return of dung and urine to a sward. Sheep in cages are used for this purpose, grass being fed from particular plots some of which receive the dung and urine collected from the cages.

Work on conservation, so far, has been mainly concerned with silage. Vacuum and sealed silo techniques have been studied together with the effects of wilting the material, and currently the use of formic acid as an additive is being investigated.

Silage can be made in small batches by the vacuum method, and the existence of a 30 ton ex railway weighbridge on the farm means that grass can be weighed in and silage weighed out. Feeding trials with different silages are carried out each winter, using individually penned animals.



Cow kennel units

Farm buildings

This article would be incomplete without mention of the investigations being undertaken by the Scottish Farm Buildings Investigation Unit which has its headquarters on the Craibstone Estate. The duties of this Unit include the responsibility of co-ordinating farm building investigations in Scotland, the carrying out of such surveys, investigations, and development work, as may be required for the furtherance of efficient farm building design, and the maintenance of an information centre covering farm building developments at home and abroad.

Building developments are carried out on a co-operative basis on the farms on the three Scottish Agricultural Colleges and at present at Craibstone, some eight projects are being undertaken. One is a cow kennel unit with adjustable interior fittings which can accommodate cattle ranging from suckler cows to yearlings. Calf-rearing problems are being studied using a novel form of calf crate-cum-pen in a climatic house, while sheep housing projects involve two forms of plastic sheet roofed buildings.

With regard to pigs, investigations include the use of fully slatted farrowing pens, the study of gases and their possible hazards in slatted floored housing, and various types of pen division construction. In the dry sow unit an investigation is being made into the use of individual pens for dry sows as opposed to stalls.

This article has been contributed by **J. M. Maddox, B.Sc. (Hons. Animal Husbandry), N.D.A.,** who is Farm Manager for the North of Scotland College of Agriculture's farm at Craibstone, Aberdeen. Born in Lancashire he graduated at the University College of Wales, Aberystwyth.

The author, **L. M. Parsons** of the Agricultural Land Service, recently visited 'Kutuzovska' which is a large State dairy farm near Kharkhov in the Ukraine. This article describes the methods used in dealing with this mechanized farm for 1,100 dairy cattle

Dairy Cattle in the Ukraine

JUST as in agriculture in any other country, farms in the Soviet Union are not simply production factories, they are also a way of life for those who live and work outside towns and cities. About one half of the 234 million population of the U.S.S.R. live in rural areas and most of these live by and work on the land.

Large numbers of both men and women work on livestock farms with cattle, sheep and pigs. Despite differences of language and customs, and particularly the vast difference in sizes of enterprises, the overwhelming majority of these very friendly people care just as much about the welfare of their charges and are just as skilled and interested in their jobs as their fellows in this country. Nevertheless, the livestock situation in the Soviet Union continues to be the cause of a great deal of official concern. There is increasing emphasis on the expansion of livestock farming, improvement of milk yields, and feeding and production of fodder.

There is also a tremendous drive for much more milk, milk products and meat to try and keep up with a population increase running at some 5 million a year and to improve the admittedly somewhat monotonous diet of the ordinary Soviet town dweller.

British farmers who are used to the family farms of these islands would be astounded by the immense size of farms in the U.S.S.R., both in terms of acreage and labour force used and in the vast numbers of livestock in single enterprises.

All the land is nationalized, of course, and there are three main types of farm units. These were created in 1927–28 from some 24 million individual peasant holdings. At the present time there are about 37,100 Kholkhozes or collective farms, 12,200 Sovkhozes or state farms and about 25 million tiny 'private' plots of around 0·3 hectares each, cultivated by members of collectives, state farm employees and other persons who are allowed to do so. There are also a number of state experimental and specialized farms.

A 'Kholkhoz' is a collective farm or peasant producer co-operative managed by a chairman and Board of 'Directors'. Its members are not paid wages as a rule but share in the residual income of the farm after a proportion has been allocated for reinvestment in buildings, machinery, schools etc.

A typical Kholkhoz supports 417 families on about 15,000 acres of land including cultivated land of about 7,000 acres, and each has on average 1,000 head of cattle of which 400 are milking cows, 700 pigs and large flocks of sheep where appropriate.

A 'Sovkhoz' is a state enterprise and has the same status as a factory or a shop or any other business enterprise in the Soviet Union. Profits accrue to the state and, conversely, any losses are financed by the state budget. The workers are wage earning employees and freely enjoy certain benefits for which the co-operator on a Kholkhoz has to pay.

Sovkhozes are even larger than Kholkhozes and run up to 70 or 80,000 acres of land, of which 25,000 are cultivated. Livestock averages about 2,100 head including 800 cows, 2,000 pigs and huge flocks of sheep. They account for about 40 per cent of the total arable area of the country. Each Sovkhoz employs about 600 workers and not quite so many women as on a Kholkhoz.

For several reasons the number of Sovkhoz has increased very considerably over the last few years. This has been partly due to the establishment of vast new state cereal farms in the New Lands areas of Siberia and Kazakhstan, and partly to organization of specialized meat, dairy and vegetable farms around major urban centres and the conversion of collectives into state enterprises.

Through the good offices of the British Council and the Soviet Ministry of Agriculture, and by the courtesy of Academician I. A. Danilenko, Chief

of the Ukrainian Forest and Steppe Agricultural Research Institute, the writer was recently privileged to visit 'Kutuzovska', a large state dairy farm some 18 km from Kharkhov in the Ukrainian S.S.R. Until 1961, this farm was devoted to vegetable production and milk, consisting of 4,092 ha of which 3,669 ha were agricultural land; 3,164 ha were deep black Chernosem soil cultivated for crops.

In 1963, the Institute organized the Sovkhoz as a model in order to demonstrate, experiment with and evaluate working techniques by establishing a large dairy unit on the loose housing system. By 1965, it carried over 2,500 cattle, and today there are 1,100 cows in milk and 600 replacements of all ages being reared. There are about 2,000 other cattle being reared for meat on the holding.

By 1964, production had increased to the point where each 100 ha (247 acres) produced 578 centners (12,700 gal) of milk and 101 centners (5 tons) of meat for the city of Kharkhov. These achievements have since been considerably increased.

The farm manager is Mr. L. H. Shovkoviy and members of the Institute staff are responsible for technical innovations under the Deputy Director of the Institute, Mr. L. H. Grebin, and Mr. A. C. Federov, who is liaison officer at the farm.

The design of the buildings and machinery, and their installation, were jointly shared by members of the Institute staff, the State Construction Bureau and the Agricultural Machinery and Buildings Institutes of Moscow and Kiev. The cows were mostly Black Spotted or Friesian type with some Simmenthal, Lebedinskaya, Red Steppe and Whiteheaded Ukrainian breeds. Their average yield was 2,800 Kg (616 gal) over a 300-day lactation. By systematic and selective breeding it is planned to raise this to a target of 4,000 Kg (880 gal).

At any time 200 head are housed in a traditional 4-row cowshed, 800 in two loose housing systems and 100 in veterinary or calving accommodation. There is a large calf rearing unit of 500 up to six months of age.

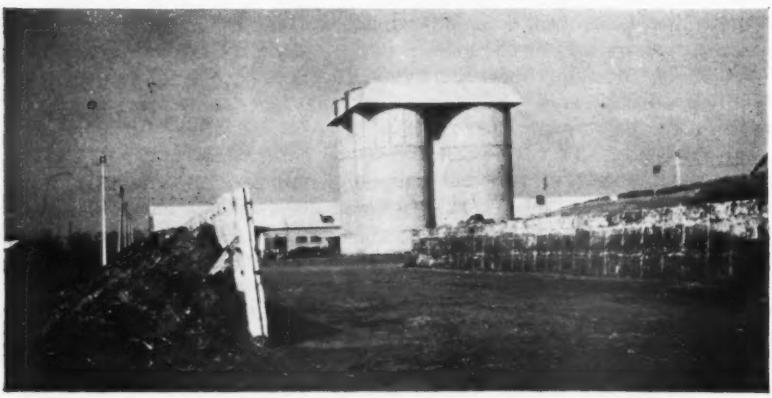
For the 400 loose housed cows the milking block is separate and consists of two 10–20 herring-bone parlours, one on each side of a large dairy where milk is prepared for transit to consumers in bulk tankers. The cows in the traditional house are milked by a pipeline plant. The whole herd is milked twice daily. The building complex covers an area of 12 ha, including the silos and manure disposal areas.

Buildings

The covered yards for 400 cows consisted of heavy standard concrete framed structures 120 m long and 18 m wide with a conventional pitched apex roof. Each 12 m bay had centre stanchions to support the trusses and there was a pair of extractor chimney ventilators for every 30 metres of length. This building allowed 5·2 m^2 (55 sq. ft) of lying space per cow and about 21·5 m^3 (750 cu. ft) of air space. Height to eaves was 3·1 m and ridge height 9·3 m. It was claimed that this generous allowance was perfectly satisfactory even during those periods of the year when the temperature remained at minus 11° or 12° C for some weeks and when deep snow was on the ground. In 1968, something like 4 m of snow fell in this district. Bedding consisted of straw. The open yards or loafing areas allowed about 8 m^2 per cow (80 sq. ft). All the other buildings were of the same basic standard construction working on a 6 m module.

Infilling varied from farm to farm or building to building on the same farm, depending on availability of local material. Brick, concrete block or precast slabs were generally used.

No insulation, as such, was usually provided except for calf housing, but immensely thick walls were the rule to conserve heat. Roofing materials were asbestos, tiles or even felt.



Brick tower silos and (foreground) open bunker silos for maize silage—Kutuzovska

Feeding

During winter months the bulk fodder consisted of maize silage made in bunker type silos each holding 2,000 tons. These silos were 50–70 m wide and the settled chopped silage was 3–4 m high. Originally tower silos were used but these were given up because of excessive costs of machinery and labour. The silage was removed by an automatic sweep shredder/blower type YPK 25 mounted on a Belarus tractor. This machine blew into a side delivery trailer PCN-1 at a stated rate of 25 tons/hr. The trailer itself was mechanically used to fill semi-covered mangers along the open yards. The mangers of the cowhouse were filled by conveyors.

In the parlour, concentrates were fed from overhead bins and conventional augers fixed to the mangers, whilst in the sheds a trolley system was used. Hay or straw was fed to yards from a centre sited Dutch barn type of framed building via feed fences. A typical ration during winter consisted of 28–30 kg maize silage, 1 to 1·5 kg hay and 250 to 300 gms of concentrates per kg of milk. Cows in the sheds also received fodder beet.

Green chopped fodder was fed by similar mechanical means during the summer. That was usually maize, winter rye or oats, although efforts are being made to use other crops such as lucerne, vetches and other legumes or Sudan grass.

Mucking out

The conventional yards were allowed to build up a dung pack of about 2 m depth. This was then removed by foreloaders and tractors. The cow-sheds had a flat floor and were scraped by tractor blades, and the other housing had gutters with mechanical cleaners. Dung was mechanically transported to huge heaps at the side of the compound.

Labour

About 34 men and women were employed at Kutuzovska: 8 girls milking, 8 herdsmen and women, 3–4 tractor drivers, a veterinary surgeon and assistant, and general workers and calf attendants—men and women.

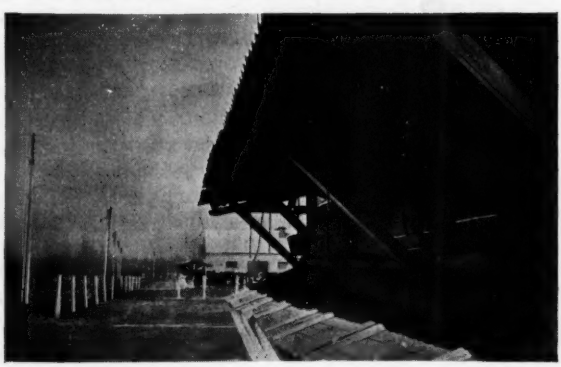
A typical day's work was as follows:

0600–1000	Milking Feeding cows in parlour Cleaning apparatus and parlour	Milkers
0700–1000	Loading and feeding silage (or fodder)	Tractor drivers
0600–0900	Insemination Calving as necessary	Inseminator Stockmen
0800–1600	Cleaning yards and carting dung	Tractor drivers
0600–1400	Littering (winter)	Stockmen
1200–1600	Loading and feeding silage (or fodder)	Tractor drivers
1400–1700	Spreading roughage Separating cattle	Brigadier Stockmen
1200–2100	Milking	Milkers
1200–2100	Insemination Calving Vet care	Inseminator Stockmen Vet

The parlour was purely conventional except that it possessed an overhead observation floor used for visitors, time studies, veterinary observation etc., and teaching. It was warmed for winter use and cooled during summer by air conditioners. Two hundred cows were milked by two girls in about two hours. The milkers had no responsibility for dealing with bulk tanks, separators etc., or for work in the dairy.

All the cattle are artificially inseminated on a breeding plan organized by the Ukrainian Institute.

This farm receives over 5,000 visitors a year, mostly chairmen and technicians from collective and state farms in all parts of the Ukrainian S.S.R. It is used extensively for trying out new methods, teaching and research, and for experimental feeding trials. The Institute itself is taking a large part



Close-up of trailer side of silage troughs

in the organization and stocking of specialist farms in the Ukraine, and in field testing of methods on its ten experimental field stations.

It is admitted these days that the drive towards large farms, particularly for livestock, did mean some neglect of efficiency, although, of course, size of itself does mean greater ease of centralized control. The problem of the optimal size of farm enterprise receives ever-increasing attention in the Soviet Union. Although the tendency towards giant units persists, very much more attention is now being paid to specialization and rationalizing working routines and conditions of work.

On most of the farms visited—all of them probably considerably better than average—some of the cows were still milked by hand. Indeed in 1968 only 50 per cent of all milking cows were milked by machine. By 1970 it is hoped that continuing specialization and greater efficiency will have completely revolutionized livestock farming in most of the U.S.S.R.

If 'Kutuzovska' and its enthusiastic staff is a sign of future developments then one can expect productivity and output of milk to improve very rapidly indeed in the Soviet Union.

This article has been contributed by **L. M. Parsons, B.Sc. (Agric.), F.L.A.S.,** Land Commissioner with the Agricultural Land Service, Ministry of Agriculture, Fisheries and Food, London, S.W.1.

Effective plant breeding research and effective exploitation of the results of research under our own conditions are essential, if the British agricultural and horticultural industries are to remain efficient and competitive

National Seed Development Organisation Limited

Douglas Collins

THE almost endless number of new bodies known by their initials help, advise, control or confuse the individual according to his point of view.

Agriculture has enjoyed its share of these creations and one of the more recent is the National Seed Development Organisation Ltd. financed by an issued ordinary capital of £8 (held by Ministry nominees) and a Treasury loan of £200,000. As I had been in the seed trade for only three years I was flattered to have been appointed its first chairman in August, 1967, but for-

tunately my seven colleagues on the Organisation's board have considerable knowledge and experience of science, farming and the seed trade.

The State provides technical advice and research for farming and horticulture much more directly and intimately than for most other industries. Research is largely financed through the Agricultural Research Council with a current annual budget of about £12m supporting more than forty institutes and units in various parts of the country.

The breeding of improved crop varieties is undertaken at several A.R.C. stations and is usually coupled with fundamental research in related fields of pure and applied science. State plant breeding has been necessary in this country because it is long-term work in which expensive and sophisticated techniques are needed for success. This has made agricultural plant breeding a relatively unattractive field for private effort, although there have been notable exceptions, such as the Arran and Ulster varieties of potatoes.

In carrying the main burden of breeding crop varieties for the home farmer the State has enjoyed considerable success. Among many examples are the Aberystwyth 'S' varieties of grasses and clovers which have a world-wide reputation, the Cambridge cereals which are very widely grown, and the Scottish Plant Breeding Station which has made a great contribution in potatoes.

In addition to these major crops, the breeding programmes include vegetables for field and glasshouse use, root crops and specialized crops such as rhubarb and soft fruit.

One reason for the past lack of private enterprise in scientific plant breeding was that nothing like a Patent Office or the Performing Rights Society existed to protect the breeder. After spending ten or fifteen years producing and perfecting a new variety, the breeder usually found that the seed became common property and freely available for his competitors to exploit immediately he issued it.

In an increasing number of foreign countries the plant breeder is able to obtain a royalty based on the use of his varieties, and such a system was introduced in Britain by the Plant Varieties and Seeds Act of 1964. Subject to certain safeguards a breeder can now claim royalties on new varieties in an increasing range of crops. This legislation received wide support from all sections of the industry, and it is now becoming possible for the man who makes two blades of grass grow where one grew before to receive the same kind of tangible reward as authors, inventors or composers.

Although the Act was designed primarily to help private breeding it has been decided that the State financed stations should also be eligible for grants of rights. This creates a position of equity with the private breeder and allows the general taxpayer to benefit from this public investment.

It has been recognized that the introduction and development of varieties from the State stations will require a new approach in the more competitive conditions which the Act has created. Hitherto, much of the work of introducing State bred varieties was centred on the National Institute of Agricultural Botany at Cambridge. This Institute is primarily concerned with the testing of crop varieties from all sources, British and foreign, private and State, and recommending those most suitable for the home farmer and grower. This objective and important work could be open to criticism if the Institute were also thought to be promoting in any special way the products of the State stations.

Terms of reference

The terms of reference of the National Seed Development Organisation Ltd. were drawn up broadly so that the governing body (which is really a board of directors) is free to formulate a policy designed to ensure that the products of State plant breeding are made available to the whole industry, and to secure an adequate financial return to the Exchequer on the public money spent on plant breeding.

Fears have been expressed that the Organisation may have a disruptive effect on the seed trade, or that it may be the first step towards greater Government control or even nationalization. This is certainly not the view of the governing body which has already decided that it must not become just another seed company in what one would judge to be an already overcrowded industry. The Organisation will normally limit its multiplication of seed for sale to élite material of the highest standards and distribute this 'basic seed' to the trade, which will then produce further generations of seed for use by farmers and growers.

At the same time, the Organisation is re-examining the basic seed selling and distribution policies previously followed by the National Institute of Agricultural Botany. This is necessary because we have an obligation to conduct our affairs more commercially than was possible or even desirable for the N.I.A.B. This will lead to changes in the established pattern but should not cause serious concern to the seed trade if viewed in the context of the general objectives of the Organisation.

Exclusive production arrangements, royalties or levies on sales of certified seeds and marketing programmes are examples of the changes which are being applied where we think them to be appropriate. The Organisation is flexible and must experiment to find marketing methods which are effective. Other changes may follow and we feel that it would be unreasonable at this early stage to impose limits on our freedom of action to take a commercial view consistent with our overall responsibilities.

Licensing schemes

As breeders can now claim royalties on the use of protected varieties, licensing schemes must be introduced. We have considered it a sound policy to link our licensing systems for cereals and potatoes with the various seed certification and seed improvement schemes operating in Britain. This should increase the flow of authenticated seed and give the user a reasonable guarantee of quality in return for the royalty which he must pay.

Exports of seed

We intend to pursue a vigorous policy of submitting our varieties for testing abroad, especially in countries which operate restricted lists on which a variety must be included before it can be marketed. When a variety has been listed and its right to be sold is established, we will plan, in consultation with the industry, the most effective way of creating and developing an export market to secure the best return in terms of foreign exchange. This may take the form of exclusive agencies with marketing responsibilities for the export of basic seed in return for royalty payments on the subsequent multiplication or for the sale of British produced seed.

Co-operation

The principal job of N.S.D.O. is to act as a link between the A.R.C. plant breeders and the producers, processors and consumers of seed. The plant breeders are the suppliers of our raw material in the form of successful varieties and our future profitability entirely depends on this. The Organisation will seek to earn the confidence of the breeders in its ability to multiply and promote the sale of their varieties. It has no authority to direct or otherwise influence the work of the breeding stations, but we hope that our existence and association with seed traders and users will help to keep Government breeding stations in close touch with the problems and future requirements of the industry.

The seed trade is the natural partner for the Organisation. We each have an interest in supplying adequate quantities of high-quality seed to farmers and growers, and the Organisation would like to see a growth of co-operation which must be to our mutual benefit. We have had some differences with the trade and no doubt more problems will arise in the future, but these should be only temporary and capable of satisfactory solution when approached with common sense and goodwill.

The National Seed Development Organisation does not intend to become yet another organization generating paperwork and red tape to justify its existence. We will keep our administration as simple as possible and our overhead expenses as low as possible. We are at present using office premises borrowed from the N.I.A.B. in Cambridge, and a boardroom borrowed from the Ministry of Agriculture. We have been fortunate in obtaining Mr. H. N. Greenwood as our Chief Executive, through his secondment from the N.I.A.B., where he was the Head of the Multiplication Branch, and his knowledge and experience is proving invaluable.

Douglas Collins is Chairman of the National Seed Development Organisation Ltd., which was incorporated as a company on 6th March, 1967. The Chairman and Members of the Governing Body were appointed in August, 1967 by the Minister of Agriculture, Fisheries and Food acting jointly with the Secretary of State for Scotland and the Home Secretary. In its first period of operation to the end of June, 1968, the company made a profit of nearly £4,000 after servicing the Exchequer loan and paid a nominal dividend to the Exchequer.

Rabbit Survey in West Wales (1961-67)

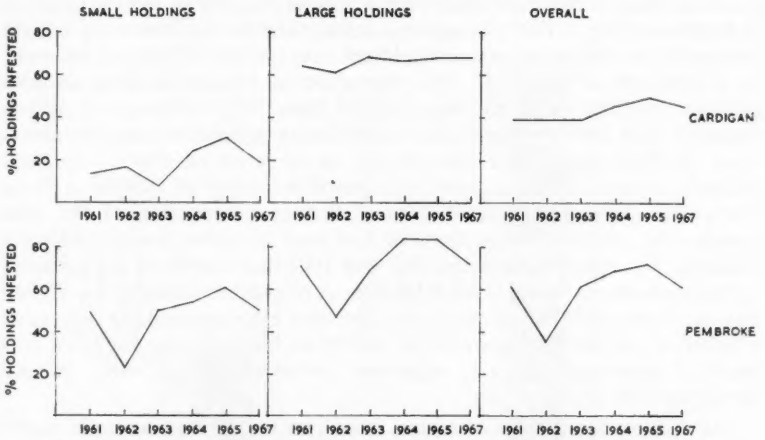
H. G. Lloyd K. C. Walton

Introduction

The myxomatosis epizootic of 1954–55 eliminated probably 99 per cent of all rabbits in Britain. Since then rabbit numbers and their distribution have increased, but little objective information is available on the recolonization of agricultural holdings by rabbits, and on the stability of such populations in England and Wales. An attempt to clarify this was begun in 1960 in West Wales when a survey of agricultural holdings was initiated in Cardiganshire and Pembrokeshire. Annual, and later biennial, surveys were carried out on the sets of holdings originally examined. Concern about population levels of rabbits in West Wales precipitated this survey which began at a time when newly-formed Rabbit Clearance Societies were actively seeking additional members, and societies' reports of rabbit infested holdings were becoming alarmingly numerous. At the time, Ministry of Agriculture staff directed their attentions mainly to reported rabbit infestations and consequently were unable to make an unbiased assessment of the situation, which only a planned survey would provide.

Design of the survey

The survey was confined to Cardiganshire and Pembrokeshire, two counties which, before the 1954–55 epizootic, were among the most severely rabbit infested areas in Britain. In Cardiganshire, excluding rough grazings, approximately half of the holdings are under 30 acres and for the purposes of the survey these were regarded as 'small' holdings and the remainder as 'large' holdings; to obtain a representative sample an equal number of small and large holdings was selected. In Pembrokeshire 40 acres was defined as the division between small and large holdings, since approximately half of the total holdings are under 40 acres. To ensure an even geographical coverage one large and one small holding was selected at random from one half of the total number of parishes in each rural district, giving 72 holdings in Cardiganshire and 125 in Pembrokeshire. Since Pembrokeshire is only one sixth greater in area than Cardiganshire, but has more parishes, the number of holdings surveyed was larger than that in Cardiganshire and consequently the survey was more intensive. The area surveyed was 1·9 per cent of the total agricultural acreage in Cardiganshire and 2·7 per cent in Pembrokeshire (these figures exclude rough grazings).



PROPORTION OF HOLDINGS INFESTED BY RABBITS IN THE TWO SIZE GROUPS, AND OVERALL IN CARDIGANSHIRE AND PEMBROKESHIRE – 1961 TO 1967

The survey was carried out by Ministry field staff in February, at a time of year when the vegetation has died back and signs of rabbits are most obvious. Also, immediately before the breeding season, rabbit populations are at their lowest and provide a better basis for comparison between years than during or immediately after the breeding season. The main purpose of visits to holdings was to record the presence or absence of rabbits; when present, they were recorded as 'slight', or 'serious', the latter being defined as an infestation which would require immediate action. The observations made were usually reported to the occupier, and any further action required was made in accordance with normal rabbit control procedure. Additional information was collected on myxomatosis, state and length of hedges, rabbit control activities, membership of rabbit clearance societies, and the previous history of rabbits on the holding.

The survey was repeated annually for the five years from 1961 to 65. Subsequent surveys have been and will be carried out in alternate years; the next being in 1969.

One of the more important features of the investigation is the retention of the same sets of holdings for each survey period. This method has two advantages: firstly, the amount of preparatory work is reduced, since basic information about holdings is simply transferred to new record sheets each year; and secondly, a detailed history of events concerning rabbits on each holding is obtained, which has revealed valuable information on rabbit populations.

As a check on the validity of both the method and the sample, a duplicate survey was done in Cardiganshire in 1961 on the other half of the parishes not selected for sample survey in 1960. The results were almost identical to those obtained from the main survey.

Results and conclusions

The survey provided data on the proportion of holdings infested by rabbits in each year. The diagram above shows this according to size-groups and

counties, and it is clear that apart from a striking decrease in infested holdings in Pembrokeshire in 1962 (the cause is unknown) there has been only a slight increase in the number of infested holdings over the 1961–65 period, followed by a slight decrease in 1967. The proportion of infested holdings in both counties was thus barely different in 1967 from 1961. Although, there has probably been little change in the overwintering population sizes of rabbits since the first survey, and little change in the total number of holdings infested, it cannot be concluded that the distribution of rabbits in West Wales has remained unaltered because further examination of the data reveals that infestations are unstable and tend to occur intermittently on holdings. For example, between 1965 and 1967 one quarter of the holdings in Pembrokeshire and one third of those in Cardiganshire changed from being infested to non-infested, or *vice versa*. The data were examined to determine whether or not the disappearance of rabbits on holdings was due to an outbreak of myxomatosis, or to organized rabbit control activities, but no correlation was found.

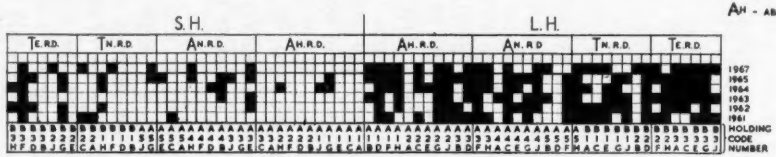
The shifting distribution of rabbits from year to year may account partly for the alarm felt by those concerned with rabbit control, since it may have been assumed that infestations reported would tend to be permanent. The survey reveals that in Cardiganshire and Pembrokeshire respectively 25 per cent and 14 per cent of all holdings surveyed have remained free of rabbits during the period 1961–67. Among the holdings in the large size-group in the two counties only two out of the total of 36 have remained free in Cardiganshire, and three out of 65 in Pembrokeshire. Diagram on page 35 shows that the chances of finding rabbits on the larger holdings is greater than on small holdings, but the occurrence of rabbits on the small holdings is in fact greater than would be expected if it was assumed that rabbits were randomly and discontinuously distributed, and that the infestations were circumscribed and occupied very little area. Infestations are, however, of such a size (area) that the chance of any infestation overlapping several farms is greater in the small size-group. In both counties the infestation rates rise steeply on holdings from 5 to 50 acres and thereafter decrease. It is not possible to estimate the mean areas occupied by infestations but there is a suggestion that they are expanding in area because there has been a relatively higher rate of increase of infestations among the small holdings during the period of the survey.

The survey showed that rabbits occurred more frequently on holdings of Rabbit Clearance Society members than on the land of non-members, but this simply means that occupiers who have rabbits are more likely to join societies. Some of the holdings examined had rabbits on each occasion that they were inspected whilst others have remained clear throughout (see diagram on page 35).

The hedgebanks of West Wales are one of the features rightly blamed for difficulties encountered during rabbit control; they are often of massive construction, and provide dry and secure refuge. Also, because the fields enclosed by hedgebanks are generally small, rabbits do not need to move far from their warrens to graze. A comparison of hedgebanks in West Wales with those in Cambridgeshire showed that whilst those in the latter county averaged only 2·3 miles per 100 acres, the Cardiganshire and Pembrokeshire hedgebanks averaged 4·3 miles. In addition, the Cambridgeshire hedges usually grow from field level without a bank and do not provide rabbits with

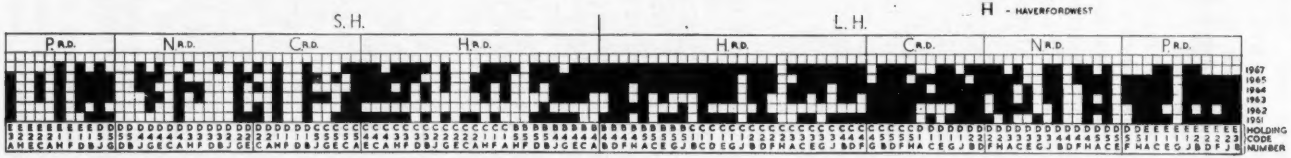
CARDIGAN

S.H. - SMALL HOLDINGS L.H. - LARGE HOLDINGS
R.D. - RURAL DISTRICT
Te - TEIFISIDE
Tn - TREGARON
An - ABERAERON
Ah - ABERYSTWYTH



PEMBROKE

S.H. - SMALL HOLDINGS L.H. - LARGE HOLDINGS
R.D. - RURAL DISTRICT
P - PEMBROKE
N - NARBERTH
C - CEMAES
H - HAVERFORDWEST



HISTORY OF RABBIT INFESTATION ON ALL HOLDINGS SURVEYED

■ – Rabbits present at time of survey

such facilities for burrowing as in West Wales. The survey confirmed that rabbits were found more frequently on Welsh holdings with overgrown hedges than those with well kept hedges. It seems that the total rabbit population in West Wales has hardly altered over a period of seven years. There has not been the dramatic recovery of which the rabbit is capable in some circumstances, and it is clear that at the present time conditions are not highly favourable for rapid increase.

The infestations examined were mostly slight in extent, and although it is known that recurrent myxomatosis does often reduce rabbit populations severely, it does not characteristically occur where rabbits are few. The disappearance of rabbits from some holdings, and the apparent lack of increase on others, (even where rabbits are found on only a small part of the holding) and the absence of any relationship to myxomatosis suggest that other factors are weighing heavily against rapid increases in a high proportion of the survey holdings. Likewise organized rabbit control does not appear to be the limiting influence. It may be that predators such as cats and foxes and, possibly badgers, which do not depend specifically nor exclusively upon rabbits for food, are able to exert a considerable influence on small pockets of rabbits in the present situation, possibly in some cases eliminating them and in others maintaining the populations at a low level. Typically, predators dependent to a large extent upon a particular prey animal are able only to remove a small proportion of the prey population and do not endanger its survival. But foxes, and domestic or feral cats, which can thrive in the absence of rabbits, deserve special consideration since their well developed hunting instincts and skills may enable them to exploit small groups of rabbits, even to the point of elimination. Predators dependent upon a particular prey are always vastly outnumbered by it, but the rabbit in recent years has probably been outnumbered by non-dependent predators in many areas. Domestic cats are common in Cardiganshire and Pembrokeshire, but foxes were very few in much of Pembrokeshire until about 1960—previously they had been almost eliminated by rabbit trappers—and this may partly account for the higher incidence of rabbits in Pembrokeshire when this survey began. Only patient field work would reveal the rôle played by predators in the current situation.

The solutions to ecological problems are rarely simple, and usually there is much interplay between several factors producing a single result. Thus, although no correlation can be found between myxomatosis and organized control activities on the disappearance or lack of increase of rabbits, it does not follow that these two factors are unimportant. By their operation, even remotely from any area under survey, conditions may be created which permit other secondary limiting factors to operate—secondary factors which alone would have little effect on population trends.

Clearly this is speculative, as is the prediction of levels of rabbits in the near and distant future. In West Wales at least, if current trends do not alter drastically, agriculture should remain relatively free from rabbits for some time to come; but, only a slight change in circumstances could readily tip the balance in favour of the rabbit, so vigilance and action must be maintained.

19. South West Hampshire

Richard Dight

THE south-west part of Hampshire, lying west of Southampton Water, is dominated by the New Forest which extends from the Solent to the Wiltshire border. To the passing motorist and to the increasing numbers of holiday-makers who visit each year, the heath and woodlands provide a tranquil scene, but beneath the outer serenity the twentieth century is intruding into this eastern flank of Thomas Hardy's Wessex.

The oil refinery at Fawley and a new power station now stand on the coastline of Southampton Water. Industry and commerce are expanding the former villages of Hythe and Marchwood. The electrification of the London to Bournemouth railway has brought the Forest within comfortable commuter distance of London. This, together with the rising population of retired people in the Bournemouth and Lymington area, has increased the demand for land and secluded houses, leading to fragmentation of holdings and an increase in part-time farming. This trend is contrary to the rest of Hampshire where farm size has been increasing with amalgamation of holdings.

The area has, however, the advantage of high light intensity and large commercial glasshouse units producing flowers and salad crops are flourishing. Efford Experimental Horticultural Station provides a testbed for new techniques which are being applied rapidly; vegetable cropping is also developing. Over-production and seasonal market fluctuations occur which discourage the development of field vegetable crops on a farm scale, and which could be a profitable enterprise of increasing importance.

The River Avon which divides the New Forest from the Dorset Heathlands is the finest fishing river of the South, and this is a very good grass growing area, with dairy herds making good use of low-lying pastures. The ancient practice of 'drowning' water meadows has almost died out. There is a potential along the Avon Valley for more intensive crop production and a few farms grow potatoes, Brussels sprouts, cabbages and other vegetable crops. The Valley farms are mostly of medium size and machinery syndication has become common. Silage-making machinery, combine harvesters, drying facilities and slurry tanks are among items syndicated. The opportunities of lowering capital commitment and reducing machinery costs have been seized on farms which are not large enough to justify these items by themselves.

To the north-west of Fordingbridge lie half a dozen parishes which form a wedge between Dorset and Wiltshire. This is a southern extension of Salisbury Plain. The soils here are very thin (the Iknield Series) with no admixture of clay with flints. These soils are susceptible to copper deficiency, and cereal root eelworm can be severe. Because of this, these large chalk farms are not so well favoured as other parts of Hampshire, and corn yields

are not so high. Break crops are being grown with more frequency, there being a small acreage of herbage seed with some spring beans and oil seed rape appearing during the last few years. The main problem is to integrate the break crop and corn to spread the harvest period and so make best use of the existing machinery. The grass break and the dairy cow are very important, and large 200-cow herds are beginning to appear. Dairy heifer rearing and intensive beef production are also becoming profitable grassland enterprises.

The sheep, which dominated the downs before barley came and the rabbit went, are now not much in evidence, but one 800-ewe flock which is very intensively managed shows how much is possible with this unfashionable enterprise.

The New Forest has some 20,000 acres of enclosed woodland which are managed by the Forestry Commission. New plantations have been made since the war which will in time screen the industrial complex developing along Southampton Water. There are also 8,000 acres of 'ancient and ornamental' woodlands. The oaks were cut and used to make ships on the Beaulieu River at Buckler's Hard some of which were used at the battle of Trafalgar.

The heather heath that predominates towards the north of the forest lies on plateau gravels which have become podzolized. The plateau is cut in two by a series of valleys and the underlying clay and sand have been exposed. These give rise to wet boggy areas in the valley bottoms and areas of bracken, gorse and bristle grass on the sands. During the War, nearly 1,000 acres of common land were ploughed up and cereals, potatoes and sugar beet grown. These were sown down to grass and now provide attractive 'lawns' which are used by holiday-makers as well as the commoners' livestock.

The common grazings are administered by the Verderers Court at Lyndhurst, and amount to 48,000 acres; 2,536 ponies and 2,345 cattle were pastured out during 1967. The open Forest provides a very useful addition to many small farms within the perambulations of the Forest. The £9 beef cow subsidy has helped their profitability, and the continued popularity of the New Forest pony for riding has made pony breeding a useful sideline, and is now as common as pig keeping as a secondary enterprise.

Many of the Forest farms rely on dairy herds, which do not make much use of the open Forest for grazing. One farmer keeps fifty cows on 40 acres, and with generous use of nitrogen has demonstrated that Forest holdings can be as intensively managed as farms in other areas.

The Guernsey is the most common dairy cow kept in the area, and the Hampshire Cattle Breeders' A.I. Centre at Lyndhurst has been responsible for making big improvements to the breed. There has been over production of Channel Island milk and the Friesian cow is now increasing at the expense of the traditional Guernsey.

Western style ranches and pony trekking centres have appeared and the development of the area for holiday-makers will continue in the future. Nevertheless, the traditional foresters' cattle and ponies are essential to preserve the ecological balance of the Forest.

The Nature Conservancy and Forestry Commission are trying to preserve the indigenous flora and fauna. The Forest has become the last refuge of some rare birds, insects and plants. It will be sad if the human population and the motor car destroy by their very presence the environment that they come to enjoy.

The author, *R. S. Clark*, Senior Assistant Land Commissioner with the Agricultural Land Service in Nottingham, discusses the impact of the Brucellosis (Accredited Herds) Scheme on farm buildings

Farm Buildings and the Brucellosis (Accredited Herd) Scheme

IT is the Ministry's policy to encourage farmers to stamp out brucellosis (better known as contagious abortion) and with this in mind the Brucellosis (Accredited Herds) Scheme came into effect on 24th April, 1967.

Farmers considering the Scheme, which is voluntary, will be wondering if adaptation or alterations to their farm buildings will be required to enable them to join and whether they will be involved in considerable capital outlay.

The need for any special buildings is fortunately small and is confined to the provision of isolation quarters and provision of suitable drainage arrangements. In the case of small herds one or two boxes should be set aside for this purpose, the number being increased according to herd numbers. These quarters may be used for ordinary housing, such as calving boxes, when not required for isolation. Siting of the isolation boxes is important and must be such that other stock cannot come into direct contact when driven past. Ideally, such boxes should be sited away from the main buildings and in their own compound to prevent intrusion by other stock but this can rarely be achieved, except when a new building is constructed.

If it is necessary to convert existing buildings where stock may pass in front, it may be possible to block up the existing entrance and provide an alternative in the rear, assuming that this alternative would be free from other stock movements. Alternatively, a baffle wall will have to be built inside the existing box or provision made to restrict movements of cattle in the vicinity of the isolation accommodation. Dividing walls between boxes should extend to ceiling height although they may be acceptable provided the height is not less than 8 feet. All walling in isolation boxes should be cement rendered or constructed of an impervious material. Doors should have minimum width of 4 ft, open outwards, and be capable of lifting off hinges as a precaution against fallen stock.

Ventilation and lighting are important factors. At least 6 sq. ft of lighting in the walls or roof should be provided. Both inlet and outlet ventilation is also considered necessary. To avoid condensation an insulated roof has many advantages. Water supply and electric lighting are very desirable.

Drainage, however, is of the greatest importance. Failure to control this in a proper manner may lead to a spread of infection throughout the herd.

When supplies of straw or other absorbent bedding are available the amount of effluent will be small and the main problem arises when the box is disinfected or cleaned out. It is essential that the disposal of such bedding should be by burning or burial.

All effluent should be capable of segregation from other farm effluent. The means of disposal must be such that it cannot convey infection to other stock on the holding. Because of the risk of droplet infection no effluent from isolation premises should be allowed to find its way into irrigation systems using spray guns. Similarly, its disposal on grazing land must be avoided. Disposal by burying is recommended. Vermin can also be a source of spreading infection and adequate precautions should be taken.

Isolation premises should be constructed in such a manner that the effluent cannot run under the door, so an inside gulley is desirable. When possible drainage from these boxes should be independent of all other farm drainage or be capable of being made so by use of a simple Penstock valve. If such a system is being used a small independent effluent tank or suitably sited soakaway may have to be provided. This will enable all effluent, during periods of isolation or infection, to be disposed of independently. The means adopted for the disposal of effluent should not be such that watercourses become a risk to nearby herds.

Difficulty may arise where cows in milk are under isolation and if it is intended to dispose of the milk for human consumption the premises will have to be adapted so that they comply with the requirements of the Milk and Dairies (General) Regulations 1959. The advice of the Divisional Veterinary Officer and the Dairy Husbandry Adviser should be sought.

One further point which should be considered is the need to provide proper facilities for securing and handling, so that veterinary officers may inspect and take blood samples from cattle in safety. Serious accidents can occur when inspecting cattle in unsatisfactory conditions and therefore a simple form of cattle crush should be provided. A yoke or cow chain might be useful in the isolation quarters. Not only will this be a safeguard against injury but will also assist in the speedy and effective handling of the cattle. The Ministry's *Fixed Equipment of the Farm* leaflet No. 13, deals with cattle crushes and handling equipment. The provision of washing facilities also would be a benefit.

The cost of providing new isolation quarters or the adaptation of existing buildings may be eligible for grant under the new Farm Improvement Scheme subject to its various conditions being satisfied.

The foregoing description for isolation accommodation represents the ideal standards for the siting and construction of new isolation boxes; boxes of this high standard are not a requirement of the Scheme as on many farms it is possible to isolate animals in disused cowsheds suitably adapted, old stables or in some existing buildings. The main criteria required are that the accommodation be capable of disinfection, that it provides complete segregation from the rest of the herd and that it can be adequately drained.

The amount of isolation accommodation needed also varies from farm to farm depending on the numbers of non-accredited stock to be purchased and the age of this stock.

Circumstances will arise where it is possible to isolate a number of animals in one group in a box or shed, in other instances young stock can be isolated

*Copies of this leaflet may be obtained from H.M.S.O. (addresses on p. 48) price 2*s.* 9*d.* (by post 3*s.* 1*d.*)

at grass in a suitable paddock or detached field. Animals likely to calve or recently calved should always be individually isolated in a box. Little infection is spread other than at calving or premature calving.

Any farmer considering joining the Brucellosis (Accredited Herds) Scheme is advised to consult his Divisional Veterinary Officer. The exact requirements of the Scheme in relation to the provision of isolation accommodation can then be discussed once the purchasing and showing programme of the herd is known, and should advice on buildings subsequently be required, the Agricultural Land Service is available for this purpose.

The author wishes to acknowledge the help and advice given by the Divisional Veterinary Officer at Nottingham in the preparation of this article

The Ministry's Publications

Since the list published in the December, 1968, issue of *Agriculture* (p. 598) the following publications have been issued.

MAJOR PUBLICATIONS

Bulletin 144. Beehives (Revised) 4*s.* 6*d.* (by post 4*s.* 10*d.*)
Experimental Husbandry No. 17. (New) 7*s.* 6*d.* (by post 8*s.*)

FREE ISSUES

ADVISORY LEAFLETS

No. 110. Frit Fly (Revised)
No. 334. Pea Moth (Revised)
No. 544. Rabbit Meat Production (Revised)

SHORT TERM LEAFLETS

No. 78. Continuous Polythene Tunnels for early Strawberry Production (New)
No. 79. Continuity Production of Glasshouse Lettuce (New)

AGRICULTURAL LAND SERVICE—TECHNICAL REPORTS

No. 15. Housing the Single Suckler Herd (New)
No. 16. Plastic Structures for Agricultural and Horticultural use (New)

PERFORMANCE TRIAL REPORT

No. 21. Potato 'Pentland Javelin' (New)

The priced publications are obtainable from Government Bookshops (address on p. 48) or through any bookseller. Single copies of free items are obtainable from the Ministry (Publications), Tolcarne Drive, Pinner, Middlesex.

Minister's Statement on Objectives for Agriculture

THE Rt. Hon. Cledwyn Hughes, M.P., Minister of Agriculture, Fisheries and Food, made the following statement in the House of Commons on 12th November, 1968.

'The Government have carefully reviewed the contribution made by agriculture to the national economy over past years. This review has amply vindicated the industry as one which has made efficient use of the resources devoted to it. Productivity has continued to rise. Output has increased. There has been a valuable saving in imports. All this has been achieved without a significant increase in support costs and consistently with our international obligations. The industry has given good value for money to the British people, both as consumers and as taxpayers.

'Against this background the Government have decided that the selective expansion of agriculture should continue, provided that this is based upon the maintenance of the rate of increase in the industry's productivity. The programme announced in 1965 took us forward to 1970/71. Now we are going to project it to 1972/73. We shall, of course, continue to take stock from year to year as we go along.

'We have had a valuable report from the Economic Development Committee for Agriculture on the import saving possibilities of agriculture to 1972/73. The Government have examined the Committee's technical assessment. In addition, we have had to take into account the likely consequences on the use of resources and support costs and our international obligations.

'The Economic Development Committee, in looking at cereals production for the next four years, believed that it would be possible to overcome the husbandry and disease problems to achieve increasing average yields. We consider that, taking into account the quality of the additional land which would have to be brought into production, the objective set by the Economic Development Committee may prove to have been a little optimistic. This year's difficult harvest underlines some of the uncertainties which cereal growers can face.

'For pigmeat, the Economic Development Committee proposed a very large increase indeed. Much of the expanded production would have to go for bacon. The Committee assumed that it would be possible to obtain a rapid expansion in the production of British bacon of the right quality and at the right price. There are some difficult technical and marketing problems in doing this. But we are looking to the curing industry to increase its share of the market by improving its productivity and competitiveness.

'Subject to these points, we welcome and endorse in broad terms the Economic Development Committee's assessment.

'Our broad objectives over the next four years will be as follows. I have sounded a note of caution about the practical pace of advance in cereals production. Our objective, however, for cereals is clear. We aim to expand production as much as is technically possible and consistent with reasonable resource, use and support cost. With this objective, goes an expansion of the appropriate break and fodder crops. For sugar beet, we shall maintain the acreage against a level of consumption of

sugar which is, at best, static. We shall continue to aim at meeting the demand for main crop potatoes for human consumption. We shall encourage the output of the right quality potatoes for the processing industries.

'It remains important that we should make significantly better use of our grassland. The Economic Development Committee considered that, on this basis, a continuing growth of beef production was possible. We should like to see an increase in suitable calf retentions. We should also like to see any increase in the dairy herd for beef production related to cheaper milk production; for example, from summer grass. We accept that we should continue an expansion of beef from the beef and dairy herds. This means that for these important commodities, beef and milk, we are aiming for increased output, similar to that suggested by the Economic Development Committee up to 1972/73. We recognise the importance of sheep and aim at a continued shift of the flock towards the hills and uplands.

'For those commodities where we are already virtually self-sufficient—namely, poultry, eggs and pork—we shall aim to increase production to meet rising demands. We shall encourage the bacon curing industry to improve further its productivity so as to produce more bacon of a quality and at a price which will attract the consumer.

'We also wish to see the encouraging expansion of the horticultural industry continuing on the basis of its competitive efficiency.

'I have tried to set out clearly the broad aims of a balanced programme for the whole industry. It goes a long way towards the import saving objectives of the Economic Development Committee. Although, for the reasons I have set out, the full import saving envisaged by the Committee would not be reached by 1972/73, nevertheless, by that time, we should achieve a net saving of about £160 million a year.

'I should emphasise that, in the context of the programme, the Government are well aware of the need for stability in our markets. This stability contains support costs and gives confidence to the industry. Measures to promote such stability already exist for many commodities, such as cereals, butter, bacon and potatoes. Further measures for other commodities may be required. This is under consideration by the Government,

'We believe that it is within the capacity of the British industry to achieve the objectives of selective expansion which I have outlined. Much must depend, however, on the ability of the industry to go on improving its technological standards; on the extent to which its rising productivity can help to hold down support costs; and on the attention which it pays to marketing. We believe that, if this progress can be made, the selective expansion can be achieved with an economic use of resources and consistently with our international obligations. The development of the programme, its cost, the resources required and the market situation will clearly have to be examined with the industry at each Annual Review.

'I believe that the industry and the country will welcome the guide lines that we are laying down for the years ahead. I am sure that farmers and growers will do their part. They can be sure that the Government believes in them and in their potential for making a further major contribution to our economic prosperity.'

Plant Viruses. (4th Edition). KENNETH M. SMITH. Methuen, 1968. 30*s*.

Much water has flowed under many bridges since the first edition of this book appeared in 1935, but the passing years have served to consolidate the position of virology as a 'with it' subject. The scope of developments in the field of plant viruses has been such that each successive edition has been virtually a new book and this edition is no exception. Chapter headings may have a familiar look but the content, illustrations and, indeed, the whole impact is new.

There are sections on the morphology and ultra-structure of virions and on their replication; on the isolation, purification, chemical nature, serology and transmission of plant viruses; on their effect on plants and the symptoms they produce; and on methods of detecting and identifying viruses. Due attention is given to questions of current interest—the propagation of plant viruses in tissue-culture, the production of virus-free plants by heat-therapy and meristem culture, the study of virus particles inside the plant's cells, and the occurrence of interferon-like substances in virus-infected plants. Major literature reviews on several subjects are mentioned and a list of references is appended to each chapter. The emphasis throughout is on viruses rather than on diseases.

Kenneth Smith is, of course, one of the best-known names in plant virology, and few could cover this wide field so skilfully. The book can be recommended to university students with little, or no, previous knowledge of plant viruses as a good general introduction to the subject. It is clearly written in a readable style, and well-produced with good illustrations. The author and subject indexes are adequate, even if it takes a botanist to find shepherds purse and chickweed—but not groundsel or pokeweed!

I.W.P.

Veterinary Parasitology. (2nd Edition). GEOFFREY LAPAGE. Oliver and Boyd, 1968. Eight guineas.

It would be foolish to pretend that this large new edition of a standard veterinary parasitology text-book, costing eight guineas, should be on every farmer's bookshelf or that its weight is conducive to bedtime browsing. However, it undoubtedly continues to be the best book of its type covering all animal parasites, worms, flukes, insects, etc., and is invaluable to veterinary and agricultural students, teachers and all workers in these fields. Though approaching the subject from a zoological classification viewpoint, the author cleverly indicates the part played by each parasite in its environment and stresses the host parasite relationship in such a way that one feels he is on intimate terms with the private life of each species. The line drawings of life cycles are models of clarity and the numerous photographs, most of which are brought to the same scale, greatly enhance the text.

The volume is surprisingly comprehensive and continuously reflects the author's very wide experience both at home and abroad. In places it might be suggested that it is too comprehensive. For example, in the sections on treatment it tends to enumerate in historical order all methods of treatment, many of which have long since gone out of practical use. Thus, the treatment of gape worms in poultry commences with antimonyl tartrate and ends with the use of 'a coiled wire or similar instrument on individual birds'. Unfortunately, one has to turn to Appendix A at the back of the book to discover that thiabendazole can be used although this is now the common and almost exclusive treatment.

If the information in the excellent appendices could have been incorporated into the body of the text, it would have improved the paragraphs on treatment and control. In general, it is these sections which the practical agriculturists will find most disappointing, mainly because they have failed to keep up to date with modern livestock husbandry methods. For example, the control of nematodirus disease in lambs by grazing methods is hardly mentioned, and the pigs in the book live all too obviously in the cottage sty era. However, these points of detail only emphasize the extreme difficulties of writing an up to the minute scientific text-book which will satisfy not only the zoologists and taxonomists but will be really 'with it' in the field of practical agriculture.

The author is to be congratulated on the very high standard achieved in this very useful text-book.

A.J.S.

Fertilisers and Soils in New Zealand Farming. C. DURING. R. E. Owen (New Zealand). 1967. N.Z.$3.50 (approx. £1 12*s*. 9*d*.).

This book brings together a vast amount of basic information on fertilizers, crop requirements and soils of New Zealand that has accumulated over the past twenty years; few references are earlier than the 1950s.

It describes the commonly used fertilizers, their chemical and physical properties, their relative values and increasing requirements. The story, inevitably, follows that of experience and research in discovery of the basic needs of New Zealand soils—the value and use of lime and phosphates, the need for sulphur and molybdenum, the increasing need for potassium and magnesium and the continuing reliance on the legume for nitrogen, particularly for pastures; as expected much of the information is on pastures.

Methods of assessment of soil and crop requirements include soil analysis, pot trials, field experiments and leaf analysis, each of which is critically examined. Of interest is the fact that because of demand and ease of operation, soil analysis has led the field and the slower calibration of soil analysis by field experiments has still to be carried out in many areas.

The value of response curves in relation to soil and climate is stressed and illustrated by two contrasting examples but the author is seldom able to use response curves for specific areas and soil types, presumably because they have yet to be determined.

The second half of the book considers the main zonal and intrazonal soils of New Zealand, their use, potential and fertilizer requirements. It is clear that the information on the nature and properties of these soils, although broadly described, provides a very useful basis for investigation and advice on treatment.

Variation within zonal soils due to topography, natural vegetation and treatment has important influences on soil potential and productivity and, although this is recognized, it is not given detailed treatment. Perhaps this could have been dealt with for a locality or region—assuming the information is available—as an example of the need for understanding soils within farms and within fields, once the basic requirements for improvement have been met and full economic production is the aim.

The book is well written with thought and care, in places with caution, as witness the sentence on p. 32, 'Superphosphate contains some 10–12 per cent of sulphur in the form of calcium sulphate (anhydrite) which seems to be available to plants'; not many would doubt that it is. While its presentation and some of its information will be of interest to others, its main value will be to those concerned with the soils and agriculture of New Zealand.

N.H.P.

Intensive Livestock Farming. W. P. BLOUNT. William Heinemann, 1968. Five guineas.

The scope of this book is so wide that it presents one of the most comprehensive accounts of livestock production ever written. All classes of farm livestock, except horses, are involved, together with chapters on rabbits and fish farming. The subjects cover breeding, housing, feeding, management, economics, disease, and even behaviour patterns. It would be almost impossible to find an effective title for what is really a miniature encyclopaedia from the pens of thirty eminent contributors and *Intensive Livestock Farming* certainly does not reveal the full breadth of this work. As the word 'intensive' has so many personal meanings, a definition based on the editor's interpretation would have been a valuable contribution to the Preface.

Doctor Blount was primarily a poultry specialist, and poultry are perhaps our most 'intensive' farm livestock, so it is not surprising that they receive such a large and detailed section, crammed with the most useful information.

Briefer, though equally valuable, sections include dairy cattle, beef cattle, sheep and pigs. Some readers may question whether the systems of dairying, beef production and sheep husbandry described are truly intensive, but they do point to means of greater productivity in these species.

In discussing feeding regimes for cattle and sheep there is some bias towards systems involving high concentrate usage, though again this may be considered inevitable within the context of intensive husbandry.

In some ways it is unfortunate that such a worthwhile technical book joins in the debate on so-called factory farming, since, though the arguments are soundly based, they are already well known. Nevertheless, the chapter on pain perception in animals is a reminder of man's responsibilities to the creatures in his charge.

This is a unique book which is bound to add to the knowledge of everyone concerned with modern animal production.

G.H.B.

Genetics and Animal Breeding. IVOR JOHANSSON and JAN RENDEL. Oliver and Boyd, 1968. Five guineas.

As a superlative instance of the printers' craft this book well merits space in any library. At this price and with these contents, the claim on the dust-jacket that 'As an introduction to the whole subject of animal genetics, this book will be welcomed by students at agricultural and veterinary colleges and by all concerned with livestock' can certainly not be sustained. In pursuing comprehensive treatment, the authors so well qualified and experienced to do both, have regrettably produced neither a suitable text-book for students nor an adequate reference book for the specialist or the general reader. In their preface they accept responsibility for the text, but immediately off-load it to other authorities for certain chapters.

The book follows the traditional sequence, from a short historical introduction, through the physical basis of inheritance, Mendelian inheritance, to population genetics, and then on to specialized chapters on blood characteristics, hereditary defects, sterility, milking characters, body size and carcass traits, wool production, etc., leading up to breeding and selection methods, and breeding values. Some of the later chapters on breeding values and selection are not introductory, they assume that the reader has already some knowledge of the background literature and techniques—if he has not, then the selected bibliographies for each chapter are not likely to help him easily to acquire it. Numerous references in the text assume that the reader has access to 'Animal Breeding Abstracts', which handicaps the general reader and imposes great effort of search on the specialist.

References are mainly to old sources, with a spattering of recent ones to give an impression of being up to date, but these are sparse and uncritical. Chapter 12 on 'Wool Production and Fur Quality' is pathetically antiquated, inaccurate and not even a good starting point for further study. The index is quite inadequate.

The book would be an excellent prize for outstanding students, who might achieve the necessary discretion to make good use of the mass of material presented.

J.E.N.

The Lucerne Crop. R. H. M. LANGER. Reed (New Zealand), 1967. $4.50 (N.Z.). (Approx. Two guineas).

It might at first be thought that the proceedings of a symposium held in New Zealand to consider what is often thought of in Britain as a difficult crop might not have much relevance to the British agricultural scene. This, however, is far from true since the general principles discussed are valid wherever the crop is grown. Some sections, for example, that on breeding, are necessarily parochial but otherwise frequent reference is made to European work and much of that described from New Zealand would clearly be potentially valuable for our conditions.

The work covers the whole range of factors concerning lucerne from its origins, distribution and improvement, through agronomy and husbandry, to its feed value in a series of short, lucid, easily read chapters. The book is sufficiently illustrated with clear and concise figures and tables. A weakness is in the indexing, but once a subject has been entered textual cross references make a follow-through relatively straightforward. It also indicates how research findings can be translated into agricultural practice.

The book provides that kind of intensive study and collation of information which is becoming increasingly more necessary. While there is much for all agriculturists, if they are prepared to search, the book will clearly be of greatest value to students and research workers as it does presuppose a sound basis of biological knowledge. It is stimulating to further thought and research as it indicates in every chapter gaps in our knowledge and areas in which more work is necessary.

J.R.

Chrysanthemums the Year Round. (3rd Edition). S. A. SEARLE and B. J. MACHIN. Blandford Press, 1968. 63*s*.

This edition is enlarged, revised and as up to date as any text-book can be. Not only are there more pages, but each page is larger.

Several new subjects including breeding and selection, meristem culture and growing for exhibition and home, have been included. The latter section explains the theory behind the practice, but the authors really excel when writing as scientific commercial producers of chrysanthemums.

Some small alterations are very significant. For instance, this edition states that the heating system must be capable of holding a 57°F night temperature under all conditions whereas previously, 60°F was recommended. This reduction could lead to considerable savings. The adoption of

5 ft wide beds in suitably sized houses has also led to increased output compared with the 4 ft wide beds in vogue in 1962.

The revision has been very thorough and many new references are cited. The result is a happy blend of science with the art of growing chrysanthemums. Some of the illustrations are very good but others lack accuracy in colour reproduction.

As is to be expected, an increase in text and number of illustrations, coupled with the inevitable rise in publishing costs, has led to a big increase in price. It is still good value and full of interest; those with a well-thumbed earlier edition would do well to replace it with the 1968 version. Chrysanthemum enthusiasts who have not read it have still a lot of knowledge in store.

A.R.C.

Farming in the Midlands. STEPHEN WILLIAMS. David Rendel, 1968. 35*s*.

Farming in the Midlands is one of a series of books written around the farming pattern of the various areas of Britain, which (to quote the dust cover of the book) 'try to provide the new entrant to the industry with a broad view of modern farming on which he can base his further education in Agriculture'.

The Midlands is not a precisely defined area, but as delineated in this book embraces a wide variety of farming conditions and systems of farming; and except for hill farming, practically every aspect of the industry is represented. Many of the comments on modern developments are in consequence of general relevance.

The book contains a wealth of statistical information, mainly on an individual county basis, interspersed with comment on the farming pattern of the areas to which the statistics relate, and on the changes which have taken place in recent years. These changes have had marked effects on the farming scene and on the attitude of mind of those engaged in the industry. Perhaps this is the best way to present statistics. At the same time, the pattern of farming of the area is so complex that this approach inevitably gives an involved picture. Indeed, one is amazed at the detailed knowledge of this large and very important farming area displayed by the author.

In covering so complex a subject in one book, it is extremely difficult to remain simple enough for the new entrant, and in places Stephen Williams expresses concepts of modern farming techniques and systems which are probably quite beyond the novice. Nevertheless, this should be a very useful volume for the student studying this area, or some section of it, or indeed for anyone wishing to get a full picture of this important agricultural region.

The author's chief theme is the change from the view of agriculture as a way of life to agriculture as a business enterprise, and this is, undoubtedly, an important concept for the new entrant to the industry to grasp.

J.G.

books received

Stockbridge House Experimental Horticulture Station Report 1967. Ministry of Agriculture, Fisheries and Food.

The Economics of Water Utilization in the Beet Sugar Industry. George O. G. Löf and Allen V. Kneese. Oxford University Press, 1968. 38*s*.

The Selling of Fruit and Vegetables: A Comparative Study of Commission Trading. (Wye College Marketing Series No. 4.). P. G. Ellis and J. H. Kirk. Copies from the College, Wye, Nr. Ashford, Kent. 7*s*. 6*d*. (free to farmers and growers).

Farm Management Handbook 1968. Universities of Bristol and Exeter. 7*s*. 6*d*.

Farming Systems and the Common Market. C. S. Barnard, H. Casey and B. H. Davey. Copies from the Agricultural Adjustment Unit, University of Newcastle upon Tyne. 10*s*. (by post 11*s*.)

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Farm Implement Buyers Guide. 1969. Copies from Farmer and Stockbreeder Publications, Dorset House, Stamford Street, London, S.E.1.

Tables of Surface Wind Speed and Direction over the United Kingdom. (Met.0 792). Meteorological Office. H.M.S.O., 1968. 50*s*.

Sheep. Research Bulletin 1968. Rowett Research Institute, Bucksburn, Aberdeen, 5*s*.

Agricultural Chemicals Approval Scheme

Sixth list of additions to the 1968 List of Approved Products for Farmers and Growers.

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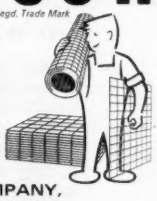

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Salaries within the ranges quoted are assessed on qualifications and experience; and the terms of most appointments include free or subsidised accommodation, education grants, family passages, good leave on full pay, etc. A contributory pension scheme is available in certain circumstances.

Most appointments are limited to candidates who should be citizens of, and normally resident in, the United Kingdom.

BOTSWANA

Senior Lecturers

RC 213/19/011

Duties: To carry out a lecture programme and certain administration duties at the Botswana Agricultural College.

Qualifications and Terms: A degree in Agriculture or related science with experience in teaching, college administration, young farmers' clubs or youth organisations. Salary: basic, Rs. 2,256—4,800 (£ Sterling 1,316—2,800) p.a. An inducement allowance in the range £156—£372 p.a. is also payable. Tax free gratuity 25% of basic salary and inducement allowance. Contract 2–3 years.

Grain Storage Specialist

RC 213/19/012

Duties: To conduct a detailed survey of grain storage problems including maize mills, traders stores, and farm stores, and to recommend suitable storage methods and pest control procedures, to train field assistants and to assist with extension campaign in grain storage methods.

Qualifications and Terms: A degree in agriculture or allied subjects, with agricultural zoology or entomology as the main subject, and experience of grain storage problems in the tropics. A post-graduate qualification in grain storage would also be desirable.

Basic salary scale Rands 2,172—4,800 (£ Sterling 1,267—2,800) a year plus an inducement allowance in the range of £ Sterling 153—372 a year. Tax free gratuity 25% of basic salary and inducement allowance. Contract 2–3 years.

FIJI

Research Officer (Horticulture)

RC 213/62/015

Duties: To work on a wide range of tropical horticultural crops in the wet and dry zones.

Qualifications and Terms: A degree in agriculture with postgraduate experience and/or training in tropical horticulture or agriculture and a good knowledge of experimental design. Salary: basic, £F1,092—£F2,181 (£ Sterling 1,045—2,086) p.a. An inducement allowance, normally tax free. In the range £508—£829 p.a. is payable direct to an officer's home bank account. Terminal gratuity 25% of basic salary and inducement allowance. Contract 30–36 months.

OFFICIAL APPOINTMENTS

KENYA

Agricultural Economist/Marketing Officer

RC 213/95/029

Duties: To assist a local Marketing Officer in problems of marketing produce by individual and Co-operatives within Land Settlement Extension work; to study and advise on suitable crops and livestock for diversification and to revise farming budgets; to liase and co-ordinate with the Marketing Statutory Boards which deal with budgeted produce and with the Ministry of Economic Planning and Development in project appraisal and formulation.

Qualification and Terms: A degree in Agricultural Economics with considerable experience in the marketing of agricultural produce. A knowledge of farm management and experience in project appraisal is also desirable. Salary: basic, £2,000—£2,750 p.a. according to qualifications and experience, subject to British Income Tax, plus a variable non-taxable overseas allowance from £540—£1,095 p.a. depending on marital status. Contract 2 years.

MALAWI

Agricultural Officer (Training)

RC 213/134/029

Duties: To set up and run a training unit, to establish training courses for farmers and staff and to administer and assist a small extension aids unit in the production of teaching materials.

Qualifications and Terms: A degree in agriculture with experience in training of farmers and technical staff and in the growing of maize, groundnuts and tobacco.

Agricultural Officers

RC 213/134/013

Duties: To be in charge of extension services or implement development projects at district level.

Qualifications: A degree in Agriculture, preferably with post-graduate training or experience in the tropics.

Salaries: £1,420—£2,600 p.a. In addition a supplement of £100 p.a. is payable direct to the officers' bank account outside Malawi and Rhodesia. Tax free gratuity 15%—25%. Contracts 2–3 years.

ZAMBIA

Agricultural Officer (Training)

RC 213/132/022

Duties: To direct and organize staff training and short courses for farmers at farm institutes and farm training centres.

Qualifications and Terms: A degree in agriculture with experience of advisory work. Salary: Kwacha 1,944—4,464 (£ Sterling £1,134—2,604) p.a. plus an inducement allowance in the range £243—£429 p.a. A supplement ranging from £233—£291 p.a. is also payable direct to an officer's bank account outside Zambia, 25% terminal gratuity. Both supplement and gratuity are tax free. Contract 3 years.

If you wish to apply for any of these appointments, or you are interested generally in an appointment overseas, please write giving your full name, age and brief particulars of your professional qualifications and experience to the:

Appointments Officer
MINISTRY OF OVERSEAS DEVELOPMENT
Room 330a, Eland House, Stag Place,
London, S.W.1.

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